24800

STORMWATER MANAGEMENT DESIGN AND RUNOFF CALCULATIONS REPORT

for

Proposed RCS Learning Center

82 Edmands Road
Framingham, Massachusetts

Applicant:
RCS Behavioral & Educational Consulting, LLC
6 Strathmore Road
Natick, Massachusetts 01706

Prepared by:
Schofield Brothers LLC
1071 Worcester Road
Framingham, MA. 01701
(508) 879-0030

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24800

TABLE OF CONTENTS

APPENDICES

24800

SECTION 1

STORMWATER MANAGEMENT REPORT

NARRATIVE AND SUMMARY

24800

SECTION 1

STORMWATER NARRATIVE & SUMMARY

Proposed RCS Learning Center
82 Edmands Road
Framingham, MA

This report contains the hydrologic computations and design information relative to the existing and proposed stormwater runoff conditions for the proposed RCS Learning Center at 82 Edmands Road in Framingham, MA. This report is part of the supporting documentation for Site Plan Review with the Framingham Planning Board.

It includes information on the proposed stormwater management system design, compliance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Regulations, the Town of Framingham Stormwater Bylaw and Regulations, and assessment of stormwater impacts of the proposed project.

The report also includes the following documents as required by the MassDEP Stormwater Regulations:

- DEP Stormwater Management Checklist and compliance calculations (Section 2)
- Soils Information (Appendix 1)
- Long Term Pollution Prevention Plan (Appendix 2)
- Stormwater Operation and Maintenance Plan (Appendix 5)

An Erosion and Sediment Control Plan is included as part of the site plan set. This project is also subject to the U.S. EPA's Construction General Permit under the NPDES Program. A full Stormwater Pollution Prevention Plan (SWPPP) will be prepared and submitted by the General Contractor prior to the start of construction.

The hydrologic modeling of existing and proposed stormwater runoff conditions at the site are included in Sections 3 and 4 respectively. The watershed maps for the models are in Appendices 3 and 4.

General Project Description
The proposed project is the construction of a school building with associated driveways, parking areas, pedestrian walkways, utilities, landscaping, and stormwater management.

The proposed project site area is 6.89 acres. Most of the proposed project occurs within the undeveloped woodland. Under existing conditions, the site contains 36,264 square feet of impervious surface, which includes natural ledge outcroppings. Under proposed conditions, the site contains 134,298 square feet of impervious surface.

There are no wetland resource areas on, or in close proximity, to the property. As such, the proposed project is not subject to the Massachusetts Wetlands Protection Act or the Framingham Wetlands Protection Bylaw. However, as a major project requiring Site Plan Review, the project falls under the jurisdiction of the Framingham Stormwater Bylaw. As such, it is subject to the MassDEP Stormwater Management Regulations.

The proposed site work for the project is shown on the site plans and includes the following:

- Construction of school building: 36,215 sf footprint.
- Construction of approximately 1,200 linear feet of driveway. The main entrance will be located on the west side of the property, coinciding with the existing gravel driveway serving the two houses on the property. Proposed access to the two houses will be off the proposed driveway to the school building.
- Construction of parking lot areas providing a total of 162 parking stalls.
- Construction of a gravity sewer to connect to the public sewer in Edmands Road.
- Construction of several stormwater Best Management Practices (BMPs) including a two (2) dry detention basins and six (6) recharge (infiltration) systems. Pretreatment BMPs include deep sump catch basins and a proprietary stormwater treatment system. The BMP treatment trains are designed to provide water quality improvements and to mitigate for groundwater recharge as required.
- Construction of a domestic water service and fire protection service from the water main in Edmands Road.
- Construction associated with grading, landscaping, walkways, utilities, driveways, and site lighting.
- Installation of construction period erosion and sedimentation controls.

Existing Site Description

The existing conditions of the site are shown on the "Existing Conditions Plan" in the site plan set and on the "Existing Conditions Watershed Map" included with this report. The Existing Conditions Watershed Map also includes the USDA Natural Resource Conservation Service (NRCS) soils boundaries and existing runoff subcatchment areas related to the project. The Existing Conditions Runoff Computations are contained in Section 3 of this report.

The site is a 6.89 +/- acre property located on the south side of Edmands Road. Two dwellings known as 82 and 82A front along Edmands Road. A shared gravel driveway provides access to both dwellings. Approximately 3/4 acres is developed for residential use. The remaining property is undeveloped woods (pine woodland with mixed hardwoods). There are no wetlands on or adjacent to the subject property.

The presently developed portion of the site includes 36,264 square feet of impervious surface including the buildings and ledge outcroppings.

Existing Stormwater Runoff
Assessment of stormwater runoff conditions is based on the topographic information shown on the Existing Conditions Plan and field reconnaissance by Schofield Brothers LLC during soil testing. In general, stormwater drains overland to surrounding, abutting properties, and to the shoulder of Edmands Road. Presently, there is no formal treatment of the stormwater runoff at the developed residential portion of the site.

Subcatchment areas, flow paths, and key design points are shown on the Existing Conditions Watershed Map (Appendix 3) and are incorporated into a hydrologic model using HydroCad, version 10.0, by Applied Microcomputer Systems, Inc. The runoff patterns for the site are generally described as follows:

Subcatchment E-1
This subcatchment includes the developed residential portion of the site as it extends upgradient through undeveloped woodland to the top of a hill located in the southern portion of the site. This subcatchment drains to the shoulder of Edmands Road.

Subcatchment E-2
This subcatchment includes undeveloped woodland on the east side of the site that drains to abutting property.

Subcatchment E-3
This subcatchment includes undeveloped woodland on the south and east side of the site, downgradient from the top of the hill. A relatively large area of off-site undeveloped woodland drains unto the southernmost portion of the subject property. This subcatchment drains to the east unto abutting property owned by the Town of Framingham.

Subcatchment E-4
This subcatchment is a small portion of woodland in the southwest corner of the subject property that drains to abutting property.

Subcatchment E-5
This subcatchment includes undeveloped woodland on the west side of the site that drains to abutting property.

Subcatchment E-6
This subcatchment includes undeveloped woodland on the northwest side of the site that drains to abutting property, which eventually drains back onto the subject property and to Edmands Road.

The model computes the existing conditions stormwater peak flows and volumes from the site to six (6) key design points, each associated with a subcatchment. The existing conditions hydrologic model establishes the base condition to compare peak flows and volumes to the proposed post development. The design points are described as follows:

- DP-1 This represents the flow conditions to Edmands Road.
- DP-2 This represents the flow conditions to an abutting property, east of the subject property.
- DP-3 This represents the flow conditions to an abutting property, southeast of the subject property.
- DP-4 This represents the flow conditions to an abutting property, southwest of the subject property.
- DP-5 This represents the flow conditions to an abutting property, west of the subject property.
- DP-6 This represents the flow conditions to an abutting property, northwest of the subject property.

The existing conditions peak flows and volumes to these design points for the 1-inch, 2-year, 10-year, 25-year and 100-year storm events are computed. The results are summarized in a table in Section 2.

Soils and Groundwater
Numerous soil test pits have been performed throughout the site to determine the soil characteristics and groundwater depths for stormwater management purposes. For detailed information, the results from on-site soil testing by Schofield Brothers LLC, soil test locations, and published NRCS data are include in Appendix 1.

The testing generally confirmed the soils identified on the NRCS Soils Mapping. The soil for the site is classified as Charlton-Hollis Rock Outcrop. Charlton-Hollis soils are moderately well drained soils that have a wide range in depth to the restrictive layer of bedrock. Hollis soils are associated with shallow depth to bedrock. The substratum soil for the Charlton soil group is a fine sandy loam, while the Hollis series consists of a gravelly fine sandy loam. They both are considered glacial till. Charlton-Hollis soil has varied permeability rates and normally has a relatively deep water table. The major limitation for these soils are that they are shallow to bedrock.

Where deeper soil was found, Charlton soil, the substratum soil (aka parent material, C-layer) consisted of a firm sandy loam to loamy sand with varying percentages of gravel, cobbles, stones and boulders. Permeability testing of the substrata (C-layer) revealed a range from 0.8 in/hr to 4.4 in/hr, which is considered suitable for infiltration.

Ledge was encountered in several holes confirming the presence of Hollis soil. Ledge outcroppings were observed throughout the site.

For runoff computation purposes, the Hydrologic Soil Groups are categorized as HSG "A" (Charlton soil) and HSG "D" (Hollis soil) consistent with the NRCS mapping and the results of our soil evaluation. In areas where deeper soil was found, the soil was categorized as HSG "A".

During the soil testing, there was no standing or weeping groundwater observed in any of the test pits. While redoximorphic features were observed in some of the test pits, it appears that these could be classified as "variegated" indicating a slowing of water as it seeps downward through the soil profile, rather than an indication of an estimated seasonal high groundwater table. Monitor wells were installed in several of the test pits to allow for groundwater reading during the high groundwater season in March and April. For design purposes, the estimated seasonal high groundwater is based on the "variegated" mottling, until monitor well readings with an adjustment factor (Frimpter calculation) indicate that the water table is lower. (Postscript: Monitor well readings taken March 23, 2016 showed groundwater at elevations at 235.9 (TH 15-21 – Recharger #1); 239.3 (TH 15-14 – Recharger #2); 235.7 (TH 15-19 – Recharger #3); 247.1 (TH 15-08 – Recharger #4); 231.0 (TH 15-01 – Recharger #5); and 240.2 (TH 15-04 – Recharger #6).

The entire site is not located within a Zone II recharge area. Therefore, water quality volume calculations are based on ½ inch.

In accordance with current FEMA mapping and profile information (June 2010) the site is located in a Zone X (unshaded). The subject property is above the 500-year flood plain.

Proposed Stormwater Management Design

The proposed project includes several stormwater Best Management Practices to meet the current MassDEP Stormwater Management Regulations. Under the regulations, the project is classified as "New Construction." The proposed project will result in an increase of more than 2 acres of impervious surfaces (building addition and pavement). Due to the shape of the lot, the soil conditions (and presence of ledge), and the proposed development program, stormwater management has been a challenge to mitigate post-development stormwater runoff conditions associated with an increase in impervious area and to comply with the full extent of the current stormwater management regulations. As required by the Stormwater Management Regulations, Limited Impact Development (LID) concepts have been considered for this project and have been incorporated into the design where feasible.

The following summarizes the features of the proposed stormwater management design:

1. Several groundwater recharge (infiltration) systems to provide required recharge as well as water quality treatment. These BMPS are classified as a Limited Impact Development (LID) technique.

2. A surface detention basin and a subsurface detention basin are proposed to mitigate peak flow.

3. Deep sump catch basins and a proprietary stormwater treatment system provide required pretreatment of runoff from paved surfaces prior to entering groundwater recharge systems. All catch basins will have oil/debris traps.

4. A level spreader is proposed to distribute outflow from the subsurface detention basin over a wider outfall to minimize scouring and erosion.

The design of the system was planned to balance the hydrology of the site to Edmands Road and abutting properties, both in terms of groundwater recharge and surface discharges to the existing discharge points.

Detailed calculations of the Stormwater Management System components and complete information as to compliance with the ten (10) Stormwater Standards of the Stormwater Management Regulations are contained in Section 2 of this report. The hydrologic and flood routing computer modeling calculations for existing and proposed condition are included in Section 3 and Section 4, respectively.

Watershed Modeling and Best Management Practices Design
The hydrologic analysis of the existing conditions and proposed watershed was based on the nationally recognized watershed modeling techniques developed by the USDA, Soil Conservation Service (SCS). The techniques and runoff models are described in the following SCS publications:

"Urban Hydrology for Small Watersheds, Technical Release Number 55", 1986 and Technical Release 20.

National Engineering Handbook, Hydrology, Section 4, 1972.

"A Method for Estimating Volume and Rate of Runoff in Small Watersheds, Technical Release No. 149" 1973.

"Hydrology Handbook for Conservation Commissions" March 2002, Mass. DEP.

The watershed modeling was performed using computer software "HydroCAD" version 10.0 by Applied Microcomputer Systems, which is based on the publications referenced above.

Best management practices were designed utilizing the following publications:
DEP "Stormwater Management Standards Handbook", February, 2008

Rainfall depths for 24-hour duration storms selected for the hydrologic analysis computations are as follows:

1 year storm	2.5 inch
2 year storm	3.2 inches
10 year storm	4.6 inches
25 year storm	5.4 inches
100 year storm	6.6 inches

24800

SECTION 2

Stormwater Standards Summary
MA DEP "Checklist for Stormwater Report"
Illicit Discharge Statement
Standard 1 – Scour and Erosion Calculations
Standard 3 – Recharge Calculations
Standard 4 -TSS Removal Calculations

24800

SECTION 2
STORMWATER STANDARDS SUMMARY

Proposed RCS Learning Center
82 Edmands Road
Framingham, MA

MassDEP Stormwater Regulations Standards:

Standard 1: (Untreated Discharges)

There are no new stormwater conveyances proposed that discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

Prior to discharge, stormwater runoff is passed through pretreatment BMPs including deep sump catch basins and proprietary separators and treatment BMPs including subsurface rechargers. Where stormwater runoff is discharged to land, the outfalls are protected with riprap at non-erosive velocity.

The stormwater management system has been designed to assure that the runoff peak flows after development will be the same or less than the existing conditions. For all discharge points, the proposed peak flows are less than the existing peak flows. Because there are no observable erosion conditions under existing conditions, there will be no erosion conditions produced under proposed conditions. As a matter of our standard practice, outfalls are lined with riprap to ensure that no scour or erosion occurs directly at the outfall.

Standard 2: (Peak rate control and flood protection)

There will be no increase on the peak rate of discharge from any storm event up to and including the 100-year storm event. The computations have been made for the 1, 2, 10, 25 and 100-year storms. The computations for the peak rates of runoff at the various design points are contained in Section 3 and Section 4 of this report and the results are summarized in the following table below.

For stormwater runoff from the paving parking surfaces in front (north) of the school building, peak flow attenuation is accomplished with a surface detention basin at the northwest corner of the property. For stormwater runoff from the paving parking surfaces in back (south) of the school building and the school roof, peak flow attenuation is accomplished with a subsurface detention basin located at the south side of the property. For each basin, an outlet control structure regulates the flow for the various storm events. While the peak rates are controlled, there is an increase in volume to some

of the design points as shown on the summary tables. However, the increase in volume occurs over the 24-hour storm event.

TABLE 1 - Existing vs. Proposed Peak Flows and Volumes at Design Points

		DP#1 (Edmands Road)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
1 year	2.5 in	0.06	0.01	0.016	0.008
2 year	3.2 in	0.24	0.16	0.039	0.094
10 year	4.6 in	1.00	0.73	0.107	0.302
25 year	5.4 in	1.57	1.30	0.154	0.433
100 year	6.6 in	2.51	2.50	0.234	0.641

		DP#2 (to North East)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
1 year	2.5 in	0.81	0.05	0.077	0.009
2 year	3.2 in	1.58	0.20	0.135	0.020
10 year	4.6 in	3.45	0.63	0.275	0.047
25 year	5.4 in	4.62	0.92	0.364	0.066
100 year	6.6 in	6.47	1.40	0.506	0.098

		DP#3 (to South East)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
1 year	2.5 in	0.19	0.16	0.049	0.078
2 year	3.2 in	0.69	0.55	0.115	0.142
10 year	4.6 in	2.50	1.96	0.303	0.391
25 year	5.4 in	3.83	2.94	0.434	0.565
100 year	6.6 in	6.05	4.90	0.655	0.843

		DP#4 (to Southwest)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
1 year	2.5 in	0.00	0.00	0.000	0.000
2 year	3.2 in	0.00	0.00	0.000	0.000
10 year	4.6 in	0.01	0.01	0.003	0.003
25 year	5.4 in	0.03	0.03	0.006	0.006
100 year	6.6 in	0.09	0.09	0.012	0.012

		DP#5 (to West)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
1 year	2.5 in	0.36	0.36	0.039	0.037
2 year	3.2 in	0.77	0.74	0.070	0.067
10 year	4.6 in	1.77	1.65	0.148	0.143
25 year	5.4 in	2.41	2.23	0.199	0.197
100 year	6.6 in	3.43	3.34	0.280	0.284

		DP#6 (to Northwest)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
1 year	2.5 in	0.34	0.20	0.032	0.015
2 year	3.2 in	0.63	0.36	0.055	0.025
10 year	4.6 in	1.31	0.71	0.109	0.049
25 year	5.4 in	1.73	0.92	0.143	0.063
100 year	6.6 in	2.39	1.25	0.196	0.086

Standard 3: (Recharge to Groundwater)

To meet the current MassDEP Stormwater Regulations, Standard 3 requires that a minimum 0.60, 0.35, 0.25 & 0.10 inches of runoff from the impervious surfaces must be recharged to the ground for hydrologic soil groups (HSG) A, B, C, & D respectively. The subsurface rechargers are designed to store the required recharge volume. In all cases, the rechargers are also designed to store the water quality volume requirement of

0.5 inches. All rechargers provide storage to capture the required volume. In addition to recharge, they provide water quality functions. They do not provide peak flow mitigation for the 10-year and greater storm events. That function is provided by subsequent detention basins.

The total proposed impervious surface is 139,858 square feet. This includes 29,120 square feet within a HSG A and 110,738 square feet within a HSG D. The minimum required infiltration for the site under the MassDEP Stormwater Regulations is 2,379 cubic feet. The impervious area draining to infiltration BMP's is 123,714 square feet. Note that the percent impervious area draining to infiltration BMPs is 88%, which exceeds the required minimum of 65%. Applying a *Capture Area Adjustment* of 1.13 to account for impervious surfaces that are not directed to infiltrating BMP's, results in an *Adjusted Required Recharge Volume* of 2,688 cubic feet.

The proposed six (6) recharger units result in a total recharge volume of 6,620 cubic feet. This not only exceeds the adjusted required recharge volume but is also provides sufficient water quality volume (see Standard 4). The proposed infiltration BMP's all drain within 72 hours.

Standard 4: (80% TSS Removal)

This project incorporates several stormwater pretreatment BMP's such as deep sump catch basins and treatment BMP's such as proprietary treatment practices (Stormceptor®), and subsurface recharge systems.

Non-contaminated runoff (roof area) is routed directly to subsurface recharge systems, wherever possible. Contaminated runoff from paved surfaces is routed through a combination of deep sump catch basins and proprietary treatment practices for pretreatment prior to entering subsurface recharge systems.

Because the site is not in a critical area, the Water Quality Volume (WQV) is 0.5 inch for the site. The total proposed impervious surface is 139,858 square feet. The *Required Water Quality Volume* is 5,827 cubic feet. The proposed subsurface recharge systems provide a water quality volume of 6,620 cubic feet.

TSS Removal Calculation Worksheets for each treatment train are included at the end of this section.

Two Stormceptor units are included in the project. Stormceptors were sized from the Stormceptor® design manual table to handle the contributing impervious area to be treated. The Stormceptor® selected is an approved proprietary treatment BMP under the "Technology Acceptance and Reciprocity Partnership" (TARP). The design sheet and performance documentation is included at the end of this section. The New Jersey DEP Certification letter for the Stormceptor® technology is included in this Section 2. A TSS removal of 50% is used in the design.

The weighted average for TSS removal for the site is 80.2%.

In compliance with Standard 4, a Long-Term Pollution Prevention Plan is included in Appendix 2.

Standard 5: (Land Use with Higher Potential Pollutant Load)

Not Applicable. The parking lot has less than 1,000 trips per day and is therefore not considered a high intensity parking lot.

Standard 6: (Critical Areas)

Not Applicable. The site is not located in a critical area as defined in the MassDEP Stormwater Regulations.

Standard 7: (Redevelopment)

Not Applicable. Although the existing project site includes two residential houses, the proposed development occurs over much of the undeveloped site and there is a large increase in impervious surface. Therefore, this project is treated as new construction and is designed to meet the full requirements of the ten (10) Standards, as applicable.

Standard 8: (Erosion, Sediment Control)

Erosion and sediment control BMPs are included in the Erosion and Sediment Control Plan prepared for the initial project setup. This project is subject to the NPDES Phase II requirements for construction sites. Coverage under the NPDES Construction General Permit is required.

The Contractor shall prepare a SWPPP and file a Notice of Intent with the EPA for coverage under the Construction General Permit.

Standard 9: (Operation & Maintenance)

A Stormwater Operation and Maintenance Plan for the stormwater system is included in Appendix 5.

Standard 10: (Illicit Discharges)

The proposed building design will be in compliance with state and local building codes. There are no illicit discharges designed or proposed. An Illicit Discharge Statement is included in Section 2 of this Report.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

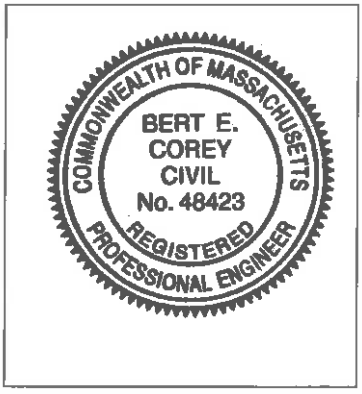
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Bert E Corey 3/21/16
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): Subsurface Recharger Systems

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

☒ The ½" or 1" Water Quality Volume or

☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

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Schofield Brothers LLC
1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

March 21, 2016

24800

Framingham Engineering Department
100 Western Avenue
Framingham, MA 01702

RE: Illicit Discharge Compliance Statement

This is to verify that:

1. To the best of our knowledge and belief, the existing property at 82 Edmands Road, Framingham, Massachusetts contains no illicit discharges as defined in the DEP Stormwater Regulations.
2. The design of the proposed Stormwater System for the proposed RCS Learning Center project includes no proposed illicit discharges and no illicit discharge connections.
3. A Long Term Pollution Prevention Plan for the stormwater system has been included with the Stormwater Report.
4. Sewage Disposal will for the facility will be connected to public sewer in Edmands Road.

Please feel free to contact me if you have any questions

Sincerely yours,
Schofield Brothers LLC

Bert E. Corey, P.E.
Senior Engineer / Project Manager

Standard 1 – Scour & Erosion Calculations

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Schofield Brothers LLC
1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

Stormwater Calculations – Scour & Erosion

RCS – Framingham, MA

DETENTION BASIN #1 & RECHARGER #1 OUTLET PIPES

Maximum Velocity:
Pipes discharges into 6" trap rock
Discharge flows across riprap lined swale
Inv. In = 236.8
Inv. Out = 235.5
Length = 20'
Width = 10'

	2 Year	10 Year	100 Year
Maximum Velocity	1.36 ft/sec	2.22 ft/sec	3.17 ft/sec
Depth in Channel	0.05'	0.11'	0.19'

Permissible velocity for 5-10% channel slope for grass-legume mix is 3.0 ft/sec

---

Shear Stress:

$\tau_{bed} = (62.4 \text{ lbs/ft}^3)(S_e)(R_h)$
$\tau_{bed} = (62.4 \text{ lbs/ft}^2)(0.065 \text{ ft/ft})(0.11 \text{ ft})$
$\tau_{bed} = 0.45 \text{ lbs/ft}^2$

Permissible shear stress for 6" trap rock is 2.0 lbs/ft^2

0.31 lbs/ft^2 < 2.0 lbs/ft^2 ← Okay

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1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

DETENTION BASIN #2 OUTLET PIPE

Maximum Velocity:
Pipe discharges into 30' wide level spreader
Discharge flows across riprap outlet
Inv. In = 239.0
Inv. Out = 237.5
Length = 20'
Width = 50'

	2 Year	10 Year	100 Year
Maximum Velocity	1.22 ft/sec	1.77 ft/sec	2.38 ft/sec
Depth in Channel	0.04'	0.07'	0.11'

Permissible velocity for 5-10% channel slope for grass-legume mix is 3.0 ft/sec

---

Shear Stress:

$\tau_{bed} = (62.4 \text{ lbs/ft}^3)(S_e)(R_h)$
$\tau_{bed} = (62.4 \text{ lbs/ft}^2)(0.075 \text{ ft/ft})(0.07 \text{ ft})$
$\tau_{bed} = 0.33 \text{ lbs/ft}^2$

Permissible shear stress for 6" trap rock is 2.0 lbs/ft^2

0.33 lbs/ft^2 < 2.0 lbs/ft^2 ← Okay

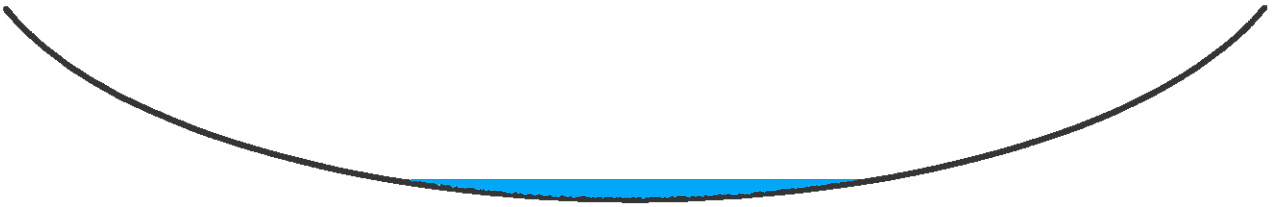
Summary for Reach DP-1: Edmands Road

Inflow Area = 2.710 ac, 57.59% Impervious, Inflow Depth > 0.42" for 2 Year Storm event
Inflow = 0.16 cfs @ 14.83 hrs, Volume= 0.094 af
Outflow = 0.16 cfs @ 14.84 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.36 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 0.5 min

Peak Storage= 2 cf @ 14.84 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 20.15 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.030
Length= 20.0' Slope= 0.0650 '/'
Inlet Invert= 236.80', Outlet Invert= 235.50'



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Summary for Reach DP-1: Edmands Road

Inflow Area = 2.710 ac, 57.59% Impervious, Inflow Depth > 1.34" for 10 Year Storm event
Inflow = 0.77 cfs @ 12.45 hrs, Volume= 0.302 af
Outflow = 0.77 cfs @ 12.45 hrs, Volume= 0.302 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.22 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.94 fps, Avg. Travel Time= 0.4 min

Peak Storage= 7 cf @ 12.45 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 20.15 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.030
Length= 20.0' Slope= 0.0650 '/'
Inlet Invert= 236.80', Outlet Invert= 235.50'

‡

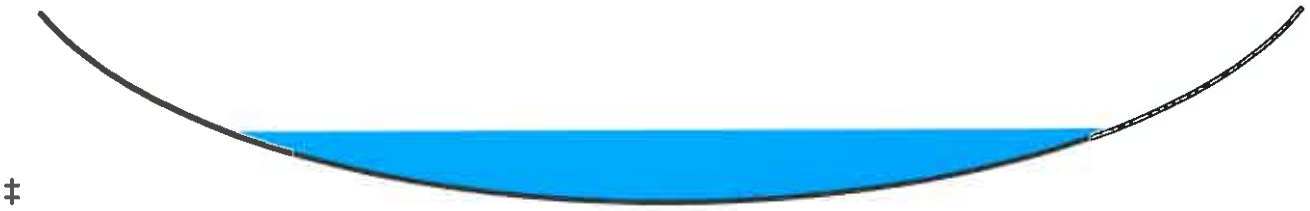
Summary for Reach DP-1: Edmands Road

Inflow Area = 2.710 ac, 57.59% Impervious, Inflow Depth > 2.84" for 100 Year Storm event
Inflow = 2.46 cfs @ 12.16 hrs, Volume= 0.641 af
Outflow = 2.46 cfs @ 12.16 hrs, Volume= 0.641 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.17 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 0.3 min

Peak Storage= 16 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 20.15 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.030
Length= 20.0' Slope= 0.0650 '/'
Inlet Invert= 236.80', Outlet Invert= 235.50'



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Summary for Reach DP-3: Southeast Abutter

Inflow Area = 3.530 ac, 44.77% Impervious, Inflow Depth > 0.48" for 2 Year Storm event
Inflow = 0.47 cfs @ 12.38 hrs, Volume= 0.142 af
Outflow = 0.47 cfs @ 12.39 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.22 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 0.5 min

Peak Storage= 8 cf @ 12.38 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 0.50' Flow Area= 16.7 sf, Capacity= 108.67 cfs

50.00' x 0.50' deep Parabolic Channel, n= 0.030
Length= 20.0' Slope= 0.0750 '/'
Inlet Invert= 239.00', Outlet Invert= 237.50'

‡

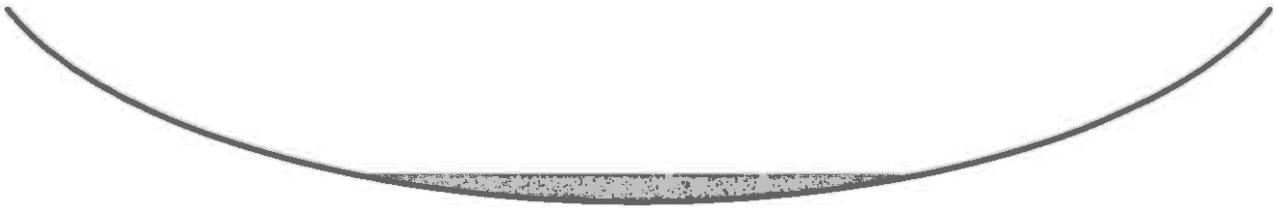
Summary for Reach DP-3: Southeast Abutter

Inflow Area = 3.530 ac, 44.77% Impervious, Inflow Depth > 1.33" for 10 Year Storm event
Inflow = 1.57 cfs @ 12.29 hrs, Volume= 0.391 af
Outflow = 1.57 cfs @ 12.30 hrs, Volume= 0.391 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.77 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 0.4 min

Peak Storage= 18 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 0.50' Flow Area= 16.7 sf, Capacity= 108.67 cfs

50.00' x 0.50' deep Parabolic Channel, n= 0.030
Length= 20.0' Slope= 0.0750 '/'
Inlet Invert= 239.00', Outlet Invert= 237.50'



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Summary for Reach DP-3: Southeast Abutter

Inflow Area = 3.530 ac, 44.77% Impervious, Inflow Depth > 2.87" for 100 Year Storm event
Inflow = 4.12 cfs @ 12.29 hrs, Volume= 0.843 af
Outflow = 4.12 cfs @ 12.29 hrs, Volume= 0.843 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.38 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 0.4 min

Peak Storage= 35 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.50' Flow Area= 16.7 sf, Capacity= 108.67 cfs

50.00' x 0.50' deep Parabolic Channel, n= 0.030
Length= 20.0' Slope= 0.0750 '/'
Inlet Invert= 239.00', Outlet Invert= 237.50'

‡

Standard 3 – Recharge Calculations

SCHOFIELD BROTHERS
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Schofield Brothers LLC
1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

Stormwater Calculations - Recharge

RCS – Framingham, MA

PROPOSED CONDITIONS

Proposed Impervious Area (Pavement, Roof) = 129,520 sf (2.97 acres)

Impervious in HSG A = 24,935 sf
Impervious in HSG D = 104,585 sf

Soils HSG: A → Recharge = 0.6 inches of runoff
Soils HSG: D → Recharge = 0.1 inches of runoff

Minimum Required Recharge:
(24,935)(0.60 in)(1ft/12 in) + (104,585)(0.10 in)(1ft/12 in)= 2,118 cf

Total impervious area to recharge:

P-1B, 1K, 1L Subcatchment impervious area	= 8,094 sf to Recharger #1
P-1D, 1F, 1H, 1J, 1I Subcatchment impervious area	= 29,228 sf to Recharger #2
P-1E, 1G Subcatchment impervious area	= 26,997 sf to Recharger #3
P-5B Subcatchment impervious area	= 7,338 sf to Recharger #4
P-3B, 3C Subcatchment impervious area	= 40,040 sf to Recharger #5
P-3A Subcatchment impervious area	= 15,795 sf to Recharger #6
Total impervious area	= 127,492 sf to Recharge BMPs

All rechargers are designed to capture water quality volume if larger than the required recharge volume.

65% Rule: 127,492 sf ÷ 129,520 sf = 0.98 > 0.65 ← Okay

Capture Volume Adjustment: 129,520 sf ÷ 127,492 sf = 1.02
Therefore, adjusted minimum required Recharge = (2,118 cf)(1.02) = 2,160 cf

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Schofield Brothers LLC
1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

Stormwater Calculations – Recharge (continued)

RCS – Framingham, MA

Capture Volume Provided by Rechargers:

Recharger	Outlet El.	Capture Volume (cf)		
Recharger #1	238.8	864		
Recharger #2	245.7	1,869		
Recharger #3	248.4	1,277		
Recharger #4	256.4	1,210		
Recharger #5	243.8	2,500		
Recharger #6	250.8	1,301		
Total		9,021	>	2,160 cf ← Okay

Individual Recharger Calculations

Recharger #1 (see attached HydroCAD printouts for detailed design information)
Contributing Impervious Area: 8,094
Required Recharge Volume: (5,595 sf)(0.1 in/hr)(1/12 in/ft) + (2,499 sf)(0.6 in/hr)(1/12 in/ft) = 172 cf
Adjusted Recharge Volume: (172 cf)(1.02) = 175 cf
Recharge Volume Provided: 864 cf

Soil Test Pits: TH 15-21, Perm 15-21, MW 15-21
ESHGW: Inconclusive based on soil morphology, bottom = 234.0
Ledge elevation: no ledge encountered
Bottom of Chambers: 237.0
Bottom of Stone elevation: 236.5
Outlet Invert or weir elevation: 238.8

Drawdown Calculation:
$Time_{drawdown}$ = (864 cf) ÷ (565 sf)(8.27 in/hr)(1/12 in/ft) = 2.2 hrs < 72 hours ← Okay

Recharger #2 (see attached HydroCAD printouts for detailed design information)
Contributing Impervious Area: 29,228 sf
Required Recharge Volume: (26,139 sf)(0.1 in/hr)(1/12 in/ft) + (3,089 sf)(0.6 in/hr)(1/12 in/ft) = 372 cf
Adjusted Recharge Volume: (372 cf)(1.02) = 380 cf
Recharge Volume Provided: 1,869 cf

Soil Test Pits: TH 15-14, Perm 15-14, MW 15-14

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1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

ESHGW: Inconclusive based on soil morphology, bottom = 239.5
Ledge elevation: no ledge encountered
Bottom of Chambers: 244.0
Bottom of Stone elevation: 243.5
Outlet Invert or weir elevation: 245.7

Drawdown Calculation:
$Time_{drawdown}$ = (1,869 cf) ÷ (1,219 sf)(1.02 in/hr)(1/12 in/ft) = 18 hrs < 72 hours ← Okay

Recharger #3 (see attached HydroCAD printouts for detailed design information)
Contributing Impervious Area: 26,997 sf
Required Recharge Volume: (23,016 sf)(0.1 in/hr)(1/12 in/ft) + (3,981 sf)(0.6 in/hr)(1/12 in/ft) = 391 cf
Adjusted Recharge Volume: (372 cf)(1.02) = 399 cf
Recharge Volume Provided: 1,277 cf

Soil Test Pits: TH 15-18, Perm 15-19, MW 15-19
ESHGW: Inconclusive based on soil morphology, bottom = 241.0
Ledge elevation: 241.0
Bottom of Chambers: 247.0
Bottom of Stone elevation: 246.5
Outlet Invert or weir elevation: 248.4

Drawdown Calculation:
$Time_{drawdown}$ = (1,277 cf) ÷ (1,056 sf)(1.02 in/hr)(1/12 in/ft) = 12.1 hrs < 72 hours ← Okay

Recharger #4 (see attached HydroCAD printouts for detailed design information)
Contributing Impervious Area: 7,338 sf
Required Recharge Volume: (7,338 sf)(0.1 in/hr)(1/12 in/ft) = 61 cf
Adjusted Recharge Volume: (61 cf)(1.02) = 62 cf
Recharge Volume Provided: 1,210 cf

Soil Test Pits: TH 15-08, TH 15-10, MW 15-08
ESHGW: 252.8
Ledge elevation: no ledge encountered
Bottom of Chambers: 255.3
Bottom of Stone elevation: 254.8
Outlet Invert or weir elevation: 256.4

Drawdown Calculation:
$Time_{drawdown}$ = (1,210 cf) ÷ (1,108 sf)(1.02 in/hr)(1/12 in/ft) = 12.8 hrs < 72 hours ← Okay

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Schofield Brothers LLC
1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

Recharger #5 (see attached HydroCAD printouts for detailed design information)
Contributing Impervious Area: 40,040 sf
Required Recharge Volume: (25,696 sf)(0.1 in/hr)(1/12 in/ft) + (14,344 sf)(0.6 in/hr)(1/12 in/ft) = 931 cf
Adjusted Recharge Volume: (372 cf)(1.02) = 950 cf
Recharge Volume Provided: 2,500 cf

Soil Test Pits: TH 15-02
ESHGW: 238.75
Ledge elevation: no ledge encountered
Bottom of Chambers: 241.3
Bottom of Stone elevation: 240.8
Outlet Invert or weir elevation: 243.8

Drawdown Calculation:
$Time_{drawdown}$ = (2,500 cf) ÷ (1,320 sf)(1.02 in/hr)(1/12 in/ft) = 22.3 hrs < 72 hours ← Okay

Recharger #6 (see attached HydroCAD printouts for detailed design information)
Contributing Impervious Area: 15,795 sf
Required Recharge Volume: (15,795 sf)(0.1 in/hr)(1/12 in/ft) = 132 cf
Adjusted Recharge Volume: (61 cf)(1.02) = 134 cf
Recharge Volume Provided: 1,301 cf

Soil Test Pits: TH 15-04, MW 15-04
ESHGW: 247.25
Ledge elevation: no ledge encountered
Bottom of Chambers: 249.8
Bottom of Stone elevation: 249.3
Outlet Invert or weir elevation: 250.8

Drawdown Calculation:
$Time_{drawdown}$ = (1,301 cf) ÷ (1,358 sf)(1.02 in/hr)(1/12 in/ft) = 11.3 hrs < 72 hours ← Okay

Stage-Area-Storage for Pond R1: Recharger #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
236.50	**565**	0
236.55	565	11
236.60	565	23
236.65	565	34
236.70	565	45
236.75	565	57
236.80	565	68
236.85	565	79
236.90	565	90
236.95	565	102
237.00	565	113
237.05	565	135
237.10	565	157
237.15	565	179
237.20	565	201
237.25	565	223
237.30	565	245
237.35	565	266
237.40	565	288
237.45	565	310
237.50	565	332
237.55	565	353
237.60	565	375
237.65	565	396
237.70	565	418
237.75	565	439
237.80	565	460
237.85	565	481
237.90	565	502
237.95	565	523
238.00	565	544
238.05	565	565
238.10	565	586
238.15	565	607
238.20	565	628
238.25	565	649
238.30	565	669
238.35	565	690
238.40	565	710
238.45	565	730
238.50	565	750
238.55	565	769
238.60	565	789
238.65	565	808
238.70	565	827
238.75	565	846
238.80	565	864
238.85	565	882
238.90	565	900
238.95	565	918
239.00	565	935
239.05	565	952
239.10	565	969
239.15	565	985
239.20	565	1,001
239.25	565	1,016
239.30	565	1,030
239.35	565	1,044
239.40	565	1,057
239.45	565	1,069
239.50	565	1,081
239.55	565	1,092
239.60	565	1,103
239.65	565	1,115
239.70	565	1,126
239.75	565	1,137
239.80	565	1,149
239.85	565	1,160
239.90	565	1,171
239.95	565	1,183
240.00	565	**1,194**

Stage-Area-Storage for Pond R2: Recharger #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
243.50	**1,219**	0
243.55	1,219	24
243.60	1,219	49
243.65	1,219	73
243.70	1,219	98
243.75	1,219	122
243.80	1,219	146
243.85	1,219	171
243.90	1,219	195
243.95	1,219	219
244.00	1,219	244
244.05	1,219	294
244.10	1,219	344
244.15	1,219	394
244.20	1,219	444
244.25	1,219	494
244.30	1,219	544
244.35	1,219	594
244.40	1,219	643
244.45	1,219	693
244.50	1,219	743
244.55	1,219	792
244.60	1,219	841
244.65	1,219	890
244.70	1,219	939
244.75	1,219	987
244.80	1,219	1,035
244.85	1,219	1,083
244.90	1,219	1,132
244.95	1,219	1,180
245.00	1,219	1,227
245.05	1,219	1,275
245.10	1,219	1,323
245.15	1,219	1,371
245.20	1,219	1,418
245.25	1,219	1,465
245.30	1,219	1,512
245.35	1,219	1,558
245.40	1,219	1,604
245.45	1,219	1,649
245.50	1,219	1,694
245.55	1,219	1,738
245.60	1,219	1,782
245.65	1,219	1,826
245.70	1,219	1,869
245.75	1,219	1,911
245.80	1,219	1,953
245.85	1,219	1,994
245.90	1,219	2,035
245.95	1,219	2,075
246.00	1,219	2,114
246.05	1,219	2,152
246.10	1,219	2,189
246.15	1,219	2,225
246.20	1,219	2,260
246.25	1,219	2,293
246.30	1,219	2,325
246.35	1,219	2,355
246.40	1,219	2,383
246.45	1,219	2,410
246.50	1,219	2,435
246.55	1,219	2,460
246.60	1,219	2,484
246.65	1,219	2,509
246.70	1,219	2,533
246.75	1,219	2,557
246.80	1,219	2,582
246.85	1,219	2,606
246.90	1,219	2,630
246.95	1,219	2,655
247.00	1,219	**2,679**

Stage-Area-Storage for Pond R3: Recharger #3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
246.50	**1,056**	0
246.55	1,056	21
246.60	1,056	42
246.65	1,056	63
246.70	1,056	84
246.75	1,056	106
246.80	1,056	127
246.85	1,056	148
246.90	1,056	169
246.95	1,056	190
247.00	1,056	211
247.05	1,056	250
247.10	1,056	288
247.15	1,056	326
247.20	1,056	365
247.25	1,056	403
247.30	1,056	441
247.35	1,056	479
247.40	1,056	518
247.45	1,056	556
247.50	1,056	594
247.55	1,056	632
247.60	1,056	670
247.65	1,056	708
247.70	1,056	746
247.75	1,056	785
247.80	1,056	823
247.85	1,056	861
247.90	1,056	899
247.95	1,056	937
248.00	1,056	975
248.05	1,056	1,012
248.10	1,056	1,050
248.15	1,056	1,088
248.20	1,056	1,126
248.25	1,056	1,164
248.30	1,056	1,202
248.35	1,056	1,240
248.40	1,056	1,277
248.45	1,056	1,315
248.50	1,056	1,353
248.55	1,056	1,390
248.60	1,056	1,428
248.65	1,056	1,466
248.70	1,056	1,503
248.75	1,056	1,541
248.80	1,056	1,579
248.85	1,056	1,616
248.90	1,056	1,654
248.95	1,056	1,691
249.00	1,056	1,729
249.05	1,056	1,766
249.10	1,056	1,804
249.15	1,056	1,841
249.20	1,056	1,878
249.25	1,056	1,916
249.30	1,056	1,953
249.35	1,056	1,990
249.40	1,056	2,028
249.45	1,056	2,065
249.50	1,056	2,102
249.55	1,056	2,109
249.60	1,056	2,116
249.65	1,056	2,123
249.70	1,056	2,131
249.75	1,056	2,138
249.80	1,056	2,145
249.85	1,056	2,152
249.90	1,056	2,159
249.95	1,056	2,166
250.00	1,056	2,173
250.05	1,056	2,194
250.10	1,056	2,216
250.15	1,056	2,237
250.20	1,056	2,258
250.25	1,056	2,279
250.30	1,056	2,300
250.35	1,056	2,321
250.40	1,056	2,342
250.45	1,056	2,363
250.50	1,056	**2,384**

Stage-Area-Storage for Pond R4: Recharger #4

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
254.80	**1,108**	0
254.85	1,108	22
254.90	1,108	44
254.95	1,108	67
255.00	1,108	89
255.05	1,108	111
255.10	1,108	133
255.15	1,108	155
255.20	1,108	177
255.25	1,108	200
255.30	1,108	222
255.35	1,108	269
255.40	1,108	316
255.45	1,108	362
255.50	1,108	409
255.55	1,108	455
255.60	1,108	501
255.65	1,108	547
255.70	1,108	593
255.75	1,108	638
255.80	1,108	684
255.85	1,108	729
255.90	1,108	774
255.95	1,108	819
256.00	1,108	863
256.05	1,108	907
256.10	1,108	951
256.15	1,108	995
256.20	1,108	1,038
256.25	1,108	1,082
256.30	1,108	1,125
256.35	1,108	1,168
256.40	1,108	1,210
256.45	1,108	1,253
256.50	1,108	1,295
256.55	1,108	1,336
256.60	1,108	1,377
256.65	1,108	1,417
256.70	1,108	1,458
256.75	1,108	1,497
256.80	1,108	1,536
256.85	1,108	1,575
256.90	1,108	1,613
256.95	1,108	1,650
257.00	1,108	1,686
257.05	1,108	1,722
257.10	1,108	1,757
257.15	1,108	1,790
257.20	1,108	1,823
257.25	1,108	1,854
257.30	1,108	1,883
257.35	1,108	1,909
257.40	1,108	1,934
257.45	1,108	1,958
257.50	1,108	1,980
257.55	1,108	2,003
257.60	1,108	2,025
257.65	1,108	2,047
257.70	1,108	2,069
257.75	1,108	2,091
257.80	1,108	2,113
257.85	1,108	2,136
257.90	1,108	2,158
257.95	1,108	2,180
258.00	1,108	**2,202**

Stage-Area-Storage for Pond R5: Recharger #5

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
240.80	**1,320**	0
240.90	1,320	53
241.00	1,320	106
241.10	1,320	158
241.20	1,320	211
241.30	1,320	264
241.40	1,320	351
241.50	1,320	439
241.60	1,320	529
241.70	1,320	619
241.80	1,320	710
241.90	1,320	800
242.00	1,320	890
242.10	1,320	980
242.20	1,320	1,070
242.30	1,320	1,160
242.40	1,320	1,250
242.50	1,320	1,340
242.60	1,320	1,429
242.70	1,320	1,519
242.80	1,320	1,609
242.90	1,320	1,698
243.00	1,320	1,787
243.10	1,320	1,877
243.20	1,320	1,966
243.30	1,320	2,055
243.40	1,320	2,144
243.50	1,320	2,233
243.60	1,320	2,322
243.70	1,320	2,411
243.80	1,320	2,500
243.90	1,320	2,589
244.00	1,320	2,677
244.10	1,320	2,766
244.20	1,320	2,854
244.30	1,320	2,943
244.40	1,320	3,031
244.50	1,320	3,119
244.60	1,320	3,208
244.70	1,320	3,296
244.80	1,320	3,384
244.90	1,320	3,472
245.00	1,320	3,560
245.10	1,320	3,614
245.20	1,320	3,635
245.30	1,320	3,656
245.40	1,320	3,677
245.50	1,320	3,698
245.60	1,320	3,735
245.70	1,320	3,788
245.80	1,320	3,841
245.90	1,320	3,894
246.00	1,320	**3,947**

Stage-Area-Storage for Pond R6: Recharger #6

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
249.30	**1,358**	0	250.34	1,358	847
249.32	1,358	11	250.36	1,358	868
249.34	1,358	22	250.38	1,358	888
249.36	1,358	33	250.40	1,358	909
249.38	1,358	43	250.42	1,358	930
249.40	1,358	54	250.44	1,358	950
249.42	1,358	65	250.46	1,358	970
249.44	1,358	76	250.48	1,358	991
249.46	1,358	87	250.50	1,358	1,011
249.48	1,358	98	250.52	1,358	1,031
249.50	1,358	109	250.54	1,358	1,051
249.52	1,358	120	250.56	1,358	1,071
249.54	1,358	130	250.58	1,358	1,091
249.56	1,358	141	250.60	1,358	1,110
249.58	1,358	152	250.62	1,358	1,130
249.60	1,358	163	250.64	1,358	1,150
249.62	1,358	174	250.66	1,358	1,169
249.64	1,358	185	250.68	1,358	1,188
249.66	1,358	196	250.70	1,358	1,207
249.68	1,358	206	250.72	1,358	1,226
249.70	1,358	217	250.74	1,358	1,245
249.72	1,358	228	250.76	1,358	1,264
249.74	1,358	239	250.78	1,358	1,283
249.76	1,358	250	250.80	1,358	1,301
249.78	1,358	261	250.82	1,358	1,319
249.80	1,358	272	250.84	1,358	1,338
249.82	1,358	294	250.86	1,358	1,356
249.84	1,358	315	250.88	1,358	1,373
249.86	1,358	337	250.90	1,358	1,391
249.88	1,358	359	250.92	1,358	1,408
249.90	1,358	381	250.94	1,358	1,426
249.92	1,358	402	250.96	1,358	1,443
249.94	1,358	424	250.98	1,358	1,459
249.96	1,358	445	251.00	1,358	1,476
249.98	1,358	467	251.02	1,358	1,492
250.00	1,358	488	251.04	1,358	1,508
250.02	1,358	510	251.06	1,358	1,524
250.04	1,358	531	251.08	1,358	1,539
250.06	1,358	552	251.10	1,358	1,554
250.08	1,358	573	251.12	1,358	1,568
250.10	1,358	595	251.14	1,358	1,582
250.12	1,358	616	251.16	1,358	1,595
250.14	1,358	637	251.18	1,358	1,608
250.16	1,358	658	251.20	1,358	1,621
250.18	1,358	679	251.22	1,358	1,633
250.20	1,358	701	251.24	1,358	1,645
250.22	1,358	722	251.26	1,358	1,657
250.24	1,358	743	251.28	1,358	1,669
250.26	1,358	764	251.30	1,358	1,680
250.28	1,358	785	251.32	1,358	1,691
250.30	1,358	805	251.34	1,358	**1,702**
250.32	1,358	826			

Standard 4 – Water Quality & TSS Removal Calculations

SCHOFIELD BROTHERS
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Schofield Brothers LLC
1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

Stormwater Calculations – Water Quality Treatment

RCS – Framingham, MA

PROPOSED CONDITIONS

Required Water Quality Volume

Proposed Impervious Areas:

Building Roof Area	=	37,960 sf (0.87 acres)
Paved Area	=	101,560 sf (2.33 acres)
Total Impervious Area	=	129,520 sf (3.20 acres)

The required water quality volume equals 0.5 inches of runoff times the total impervious area of the post-development site.

WQV = (129,520 sf)(0.5 inches)(ft/12inches) = 5,340 cf

Capture volume provided by Rechargers: 9,021 cf > 5,340 cf ← Okay

TSS Removal Rate

Refer to attached TSS Removal Calculation Worksheets

Weight Determination

The following summarizes the proposed treatment:

BMP	TSS Removal	Impervious Area
Pavement to Underground Rechargers	80%	33,346
Roof to Underground Rechargers	80%	37,960
Pavement to Stormceptors prior to Rechargers	90%	56,186
Pavement area with no treatment	0%	12,028

Weighted Average =
[(33,346)(.8) + (37,960)(.8) + (56,186)(.9) + (12,028)(0)] ÷ 129,520 = 0.83

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location: EXISTING HOUSE ROOFS TO REACH #1

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
SUBSURFACE RECHARGE #1	0.80	1.00	0.80	0.20

Total TSS Removal = 0.80

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: RCS
Prepared By: BEC
Date: 2-28-16

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location: FRONT PARKING TO RECHARGER #2

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
PROPRIETARY S.T.U. (STORMCEPTOR 2400)	0.50 (NJDEP)	1.00	0.50	0.50
SUBSURFACE RECHARGER W/ DEEP SUMP CB's	0.80	0.50	0.40	0.10

Total TSS Removal = 0.90

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: RCS
Prepared By: BEC
Date: 2-28-16

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location: FRONT PARKING TO RECHARGER #3

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
SUBSURFACE RECHARGER w/ DEEP SUMP CB's	0.80	1.00	0.80	0.20

Total TSS Removal = 0.80

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: RCS
Prepared By: BEC
Date: 2-28-16

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location: SCHOOL ROOF (NW CORNER) TO RECH #4

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
SUBSURFACE RECHARGER	0.80	1.00	0.80	0.20

Total TSS Removal = 0.80

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: RCS
Prepared By: BEC
Date: 2-28-16

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location: BACK PARKING AREA & SCHOOL ROOF (PORTIONS) TO RECHARGER #5

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
PROPRIETARY S.T.U. (STORMCEPTOR	0.50 (NJ DEP)	1.00	0.50	0.50
SUBSURFACE RECHARGER w/ DEEP SUMP CB	0.80	0.50	0.40	0.10

Total TSS Removal = 0.90

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: RCS
Prepared By: BEC
Date: 2-28-16

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location: SCHOOL ROOF (PORTIONS) TO REC'H #6

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
SUBSURFACE RECHARGE	0.80	1.00	0.80	0.20

Total TSS Removal = 0.80

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: RCS
Prepared By: BEC
Date: 2-28-16

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

8/18

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Schofield Brothers LLC
1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

Stormwater Treatment Unit Design

RCS – Framingham, MA

Computational method to convert Water Quality Volume (WQV) to Equivalent Peak Water Quality Flow Rate (WQF)

Reference: MassDEP Notice dated November 1, 2010

$WQF = (q_u)(A)(WQV)$

Where q_u = unit peak discharge (cfs / (mi^2 x in x s))
A = impervious surface drainage area (mi^2)
WQV = water quality volume (1.0 inch)
WQF = water quality flow rate (cfs)

T_c = 5.0 minutes (for all subcatchments)
From Figure 2: q_u = 800 cfs / (mi^2 x in x s)

Stormwater Treatment Unit	q_u	A (sf)	A (mi^2)	WQV (in)	WQF (cfs)	Unit Proposed
STU #1	800	29,281	0.0011	1.0	0.88	STC 2400
STU #2	800	26,958	0.0010	1.0	0.80	STC 2400

Summary for Subcatchment P-1F: Eastern Lower Drive

Runoff = 0.39 cfs @ 12.07 hrs, Volume= 0.029 af, Depth= 5.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
798	98	Paved parking, HSG A
1,445	98	Paved parking, HSG D
159	39	>75% Grass cover, Good, HSG A
192	80	>75% Grass cover, Good, HSG D
2,594	93	Weighted Average
351		13.53% Pervious Area
2,243		86.47% Impervious Area

} → TO S.T.U. #1

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment P-1H: Eastern Upper Drive

Runoff = 1.65 cfs @ 12.07 hrs, Volume= 0.124 af, Depth= 5.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
562	98	Paved parking, HSG A
8,222	98	Paved parking, HSG D
66	39	>75% Grass cover, Good, HSG A
2,124	80	>75% Grass cover, Good, HSG D
10,974	94	Weighted Average
2,190		19.96% Pervious Area
8,784		80.04% Impervious Area

→ To S.T.U. #1

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment P-1J: Loop at Entrance

Runoff = 0.78 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Description
	3,084	98	Paved parking, HSG D → TO S.T.U. #1
	2,308	80	>75% Grass cover, Good, HSG D
*	58	98	Unconnected pavement, HSG D (Ledge)
	5,450	90	Weighted Average
	2,308		42.35% Pervious Area
	3,142		57.65% Impervious Area
	58		1.85% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment P-1D: Lower Parking Lot

Runoff = 1.68 cfs @ 12.07 hrs, Volume= 0.128 af, Depth= 6.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
958	98	Paved parking, HSG A
8,796	98	Paved parking, HSG D
139	39	>75% Grass cover, Good, HSG A
1,218	80	>75% Grass cover, Good, HSG D
11,111	95	Weighted Average
1,357		12.21% Pervious Area
9,754		87.79% Impervious Area

3 → TO S.T.U. #1

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment P-1l: West side drive aisle

Runoff = 0.95 cfs @ 12.07 hrs, Volume= 0.071 af, Depth= 5.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
771	98	Paved parking, HSG A
4,592	98	Paved parking, HSG D
151	39	>75% Grass cover, Good, HSG A
823	80	>75% Grass cover, Good, HSG D
6,337	94	Weighted Average
974		15.37% Pervious Area
5,363		84.63% Impervious Area

3 → TO S.T.U. #1

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment P-3C: Driveway

Runoff = 5.87 cfs @ 12.07 hrs, Volume= 0.425 af, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Description
	14,344	98	Paved parking, HSG A
	12,614	98	Paved parking, HSG D
	3,429	39	>75% Grass cover, Good, HSG A
	6,902	80	>75% Grass cover, Good, HSG D
*	3,617	98	Unconnected pavement, HSG D (Ledge)
	40,906	90	Weighted Average
	10,331		25.26% Pervious Area
	30,575		74.74% Impervious Area
	3,617		11.83% Unconnected

→ TO S.T.U. #2

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
401-02B
Bureau of Nonpoint Pollution Control
Division of Water Quality
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bmpc_home.htm

BOB MARTIN
Commissioner

August 31, 2011

Joel Garbon
Imbrium Systems
3811 S.W. Corbett Avenue
Portland, OR 97239

Re: MTD Laboratory Test Certification for the Stormceptor STC by Imbrium Systems Corporation

Effective Date: September 1, 2011
Expiration Date: September 1, 2013
TSS Removal Rate: 50%

Dear Mr. Garbon:

The Stormwater Management Rules at N.J.A.C. 7:8 allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards provided that the pollutant removal rates have been verified by New Jersey Corporation for Advanced Technology, NJCAT, and certified by the New Jersey Department of Environmental Protection (NJDEP).

The certification process was revised through the "Transition for Manufactured Treatment Devices," dated July 15, 2011. NJDEP has determined that Stormceptor STC by Imbrium Systems is consistent with the criteria under *A. Manufactured Treatment Devices with Interim Certifications*. Therefore, **NJDEP certifies the use of the Stormceptor STC by Imbrium Systems with a 50% TSS removal rate, provided that the project design is consistent with the following conditions:**

1. The model selected for the project design must be sized in accordance with Table 1 and based on the peak flow of the New Jersey Water Quality Design Storm as specified in N.J.A.C. 7:8-5.

2. The Stormceptor STC can be used on-line and off-line.

16/18

3. A hydrodynamic separator, such as the Stormceptor STC, cannot be used in series with another hydrodynamic separator to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. The maintenance plan for the sites using this device shall incorporate at a minimum, the maintenance requirements for the Stormceptor STC, attached.

Table 1

Stormceptor STC Model	Settling Chamber Diameter in	Settling Chamber Surface Area ft²	Treatment Flow Rate cfs(gpm)	Hydraulic Loading Rate gpm/ft²
STC 450	48	12.6	0.28 (127)	10.1
STC 900	72	28.3	0.64 (285)	10.1
STC 1200	72	28.3	0.64 (285)	10.1
STC 1800	72	28.3	0.64 (285)	10.1
STC 2400	96	50.3	1.13 (507)	10.1 ←
STC 3600	96	50.3	1.13 (507)	10.1
STC 4800	120	78.5	1.77 (793)	10.1
STC 6000	120	78.5	1.77 (793)	10.1
STC 7200	144	113.1	2.54 (1141)	10.1
STC 11000	2X 120	157.1	3.53 (1585)	10.1
STC 13000	2X 120	157.1	3.53 (1585)	10.1
STC 16000	2X 144	226.2	5.09 (2282)	10.1

In addition to the attached, any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8, must include a detailed maintenance plan. The detailed maintenance plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance of the New Jersey Stormwater Best Management Manual.

NJDEP anticipates proposing further adjustments to this process through the readoption of the Stormwater Management Rules. Additional information regarding the implementation of the Stormwater Management Rules N.J.A.C. 7:8 are available at www.njstormwater.org. If you have any questions regarding the above information, please contact Ms. Sandra Blick of my office at (609) 633-7021.

Sincerely,

Ed Frankel, P.P., Acting Bureau Chief
Bureau of Nonpoint Pollution Control

C: Richard S. Magee, NJCAT
Chron file

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
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Stormwater Management
- Green Infrastructure in NJ
- Stormwater Management Rule
- Stormwater Management Rule FAQs
- NJ Stormwater BMP Manual
- Maintenance Guidance
- Tech Manual Chapters for Comment
- MTD Certifications and Guidance
  - NJCAT Verification Database
  - Stormwater MTD Protocols and Guidance Documents
  - Stormwater MTD Links
  - Stormwater MTD Archive
  - Expired Stormwater MTDs
- Additional Guidance Documents

Stormwater Permitting
- Municipal Stormwater Regulation
- Stormwater Training
- General Stormwater Permits
- Individual Stormwater Permits
- Permit Applications and Checklists

Program Links
- NJ Stormwater.org Contacts
- Bureau of Nonpoint Pollution Control
- Division of Water Quality
- Clean Water NJ

Stormwater Manufactured Treatment Devices

An MTD is required to be NJCAT verified and NJDEP certified when the MTD is used to satisfy the requirements of the Stormwater Management rule (N.J.A.C. 7:8), as a result of triggering the requirements for major development.

For projects receiving New Jersey Environmental Infrastructure Financing Program (NJEIFP) funding, an MTD must be either: 1) NJCAT verified and NJDEP certified or 2) installed using the NJEIFP MTD Funding Policy.

An MTD which is not NJCAT verified or NJDEP certified may be used as long as the MTD is not intended to satisfy the requirements of the Stormwater Management rule and is not subject to NJEIFP MTD Funding Policy.

Please note that any MTD installed should be listed on the MS4 permittee's inventory of stormwater management measures and must be properly maintained by the responsible party. Other state, federal and local requirements may apply.

NOTICE (September 1, 2011)

The manufactured treatment devices (MTDs) on this page are only approved as off-line water quality devices unless certification specifically states otherwise or unless the Department has issued a letter to indicate that it can be used as an on-line water quality device. An on-line water quality device allows the passing of storms greater than the NJDEP water quality design storm through the device. Projects that have been deemed administratively complete by the Division of Land Use Regulation for a permit requirement stormwater review as of September 1, 2011 may continue to utilize the design as specified in the prior certification letters. If no permit is required from the Division of Land Use Regulation, projects that have been deemed administratively complete by the municipality as of September 1, 2011 may continue to utilize the design as specified in the prior certification letters.

NOTICE (January 25, 2013)

MTDs that are set to expire on September 1, 2013 have been issued a new expiration date of January 25, 2015.

Click here to link to NJCAT Verification Database

Stormwater Management Manufactured Treatment Devices Certified by NJDEP	MTD Laboratory Test Certifications	Field Test Certifications	Superseded Certifications	Certified TSS Removal Rate	Maintenance Plan
AquaFilter Filtration Chamber by AquaShield, Inc.		Certification	Superseded	80%	Plan
Aqua-Swirl Concentrator by Aqua-Shield, Inc.		Certification	Superseded	50%	Plan
Continuous Deflective Separator (CDS) Unit by CONTECH Stormwater Solutions, Inc.	Certification	Certification	Superseded	50%	Plan
Downstream Defender by Hydro International, Inc.	Certification		Superseded	50%	Plan
Dual Vorter Separator by Oldcastle Stormwater Solutions	Certification			50%	Plan
Filterra Bioretention System by Contech Engineered Solutions	Certification		Superseded	80%	Plan
Jellyfish Filter by Imbrium Systems Corporation		Certification	Superseded	80%	Plan
Media Filtration Systems by CONTECH Stormwater Solutions, Inc.		Certification	Superseded	80%	Appendix A
StormPro Stormwater Treatment Device by Environment 21, LLC	Certification			50%	
StormVault by Jensen Precast, Inc.		Certification	Superseded	80%	Appendix A
Stormwater Management StormFilter by CONTECH Stormwater Solutions, Inc.		Certification	Superseded	80%	Plan
Up-Flo Filter by Hydro International		Certification	Superseded	80%	Plan
Vortechs Stormwater Treatment System by CONTECH Stormwater Solutions, Inc		Certification	Superseded	50%	Plan

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Expired Stormwater Manufactured Treatment Devices

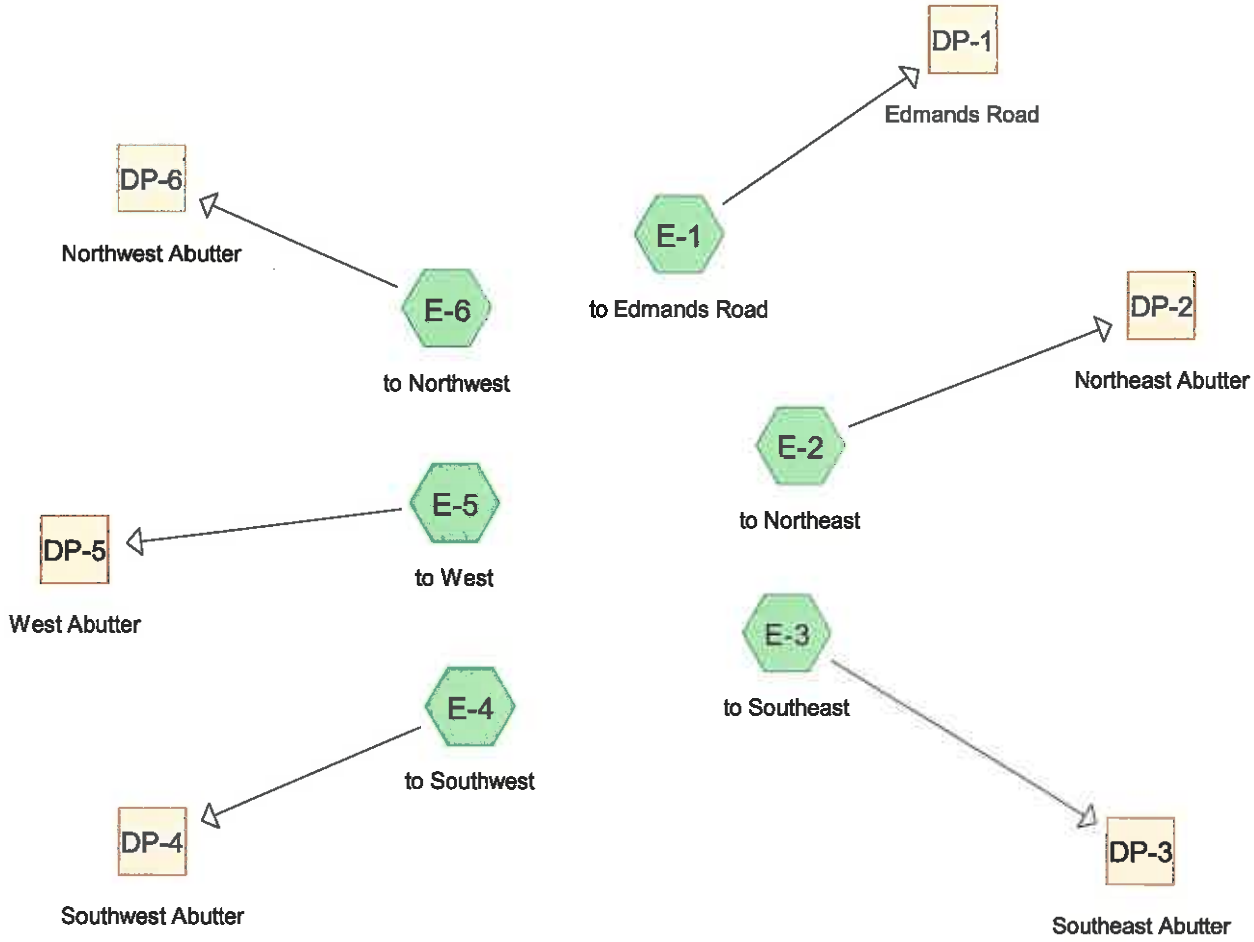
The certifications listed on this page are for site design projects that received preliminary or final site plan approval prior to January 25, 2015 or additional grandfathering listed at N.J.A.C. 7:8-1.6.

Stormwater Management Manufactured Treatment Devices	Expired Certifications	Maintenance Plan
Bayfilter by BaySaver Technologies, Inc.	Expired	Plan
BaySeparator by BaySaver Technologies, Inc.	Expired	Appendix A
FloGard Dual-Vortex Hydrodynamic Separator by KriStar Enterprises, Inc.	Expired	Plan
Hydroguard by Hydroworks, LLC	Expired	Plan
Nutrient Separating Baffle Box by Suntree Technologies, Inc.	Expired	Plan
Stormceptor OSR by Imbrium Systems Corporation	Expired	Plan
Stormceptor STC by Imbrium Systems Corporation	Expired	Plan
TerreKleen Stormwater Device by Terre Hill Concrete Products	Expired	Plan
V2B1 by Environment 21, LLC	Expired	Plan
VortSentry System by CONTECH Stormwater Solutions, Inc.	Expired	Plan

24800

SECTION 3

Existing Conditions Stormwater Model showing Stormwater Flows and Flood Routing Computations using HydroCAD version 10.00



Subcat Reach Pond Link

Routing Diagram for 24800-Existing Conditions
Prepared by Schofield Brothers LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.510	49	50-75% Grass cover, Fair, HSG A (E-1, E-2)
0.148	84	50-75% Grass cover, Fair, HSG D (E-1)
0.082	39	>75% Grass cover, Good, HSG A OFF-SITE (E-1)
0.058	80	>75% Grass cover, Good, HSG D (E-2)
0.041	96	Gravel surface, HSG A (E-1, E-2)
0.021	96	Gravel surface, HSG D (E-1, E-2)
0.045	98	Paved parking, HSG A OFF-SITE (E-1)
0.012	98	Roofs, HSG A (E-1, E-2)
0.266	98	Roofs, HSG D (E-1, E-2)
0.540	98	Unconnected pavement, HSG D (E-3, E-5, E-6)
0.088	98	Unconnected pavement, HSG D OFF-SITE (E-3)
0.015	98	Unconnected roofs, HSG D (E-4)
1.773	30	Woods, Good, HSG A (E-1, E-2, E-3, E-4, E-5, E-6)
0.296	30	Woods, Good, HSG A OFF-SITE (E-1, E-3)
3.525	77	Woods, Good, HSG D (E-1, E-2, E-3, E-4, E-5, E-6)
0.798	77	Woods, Good, HSG D OFF-SITE (E-3)
8.217	**66**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: to Edmands Road Runoff Area=54,904 sf 8.44% Impervious Runoff Depth=0.15"
Flow Length=267' Tc=12.8 min CN=59 Runoff=0.06 cfs 0.016 af

Subcatchment E-2: to Northeast Runoff Area=75,813 sf 12.44% Impervious Runoff Depth=0.53"
Flow Length=299' Tc=8.8 min CN=72 Runoff=0.81 cfs 0.077 af

Subcatchment E-3: to Southeast Runoff Area=147,246 sf 13.09% Impervious Runoff Depth=0.17"
Flow Length=446' Tc=19.1 min UI Adjusted CN=60 Runoff=0.19 cfs 0.049 af

Subcatchment E-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.00"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment E-5: to West Runoff Area=44,449 sf 6.12% Impervious Runoff Depth=0.46"
Flow Length=252' Tc=10.0 min UI Adjusted CN=70 Runoff=0.36 cfs 0.039 af

Subcatchment E-6: to Northwest Runoff Area=27,749 sf 19.32% Impervious Runoff Depth=0.61"
Flow Length=95' Tc=10.3 min UI Adjusted CN=74 Runoff=0.34 cfs 0.032 af

Reach DP-1: Edmands Road Inflow=0.06 cfs 0.016 af
Outflow=0.06 cfs 0.016 af

Reach DP-2: Northeast Abutter Inflow=0.81 cfs 0.077 af
Outflow=0.81 cfs 0.077 af

Reach DP-3: Southeast Abutter Inflow=0.19 cfs 0.049 af
Outflow=0.19 cfs 0.049 af

Reach DP-4: Southwest Abutter Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: West Abutter Inflow=0.36 cfs 0.039 af
Outflow=0.36 cfs 0.039 af

Reach DP-6: Northwest Abutter Inflow=0.34 cfs 0.032 af
Outflow=0.34 cfs 0.032 af

Total Runoff Area = 8.217 ac Runoff Volume = 0.213 af Average Runoff Depth = 0.31"
88.25% Pervious = 7.251 ac 11.75% Impervious = 0.966 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: to Edmands Road Runoff Area=54,904 sf 8.44% Impervious Runoff Depth=0.37"
Flow Length=267' Tc=12.8 min CN=59 Runoff=0.24 cfs 0.039 af

Subcatchment E-2: to Northeast Runoff Area=75,813 sf 12.44% Impervious Runoff Depth=0.93"
Flow Length=299' Tc=8.8 min CN=72 Runoff=1.58 cfs 0.135 af

Subcatchment E-3: to Southeast Runoff Area=147,246 sf 13.09% Impervious Runoff Depth=0.41"
Flow Length=446' Tc=19.1 min UI Adjusted CN=60 Runoff=0.69 cfs 0.115 af

Subcatchment E-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.01"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment E-5: to West Runoff Area=44,449 sf 6.12% Impervious Runoff Depth=0.83"
Flow Length=252' Tc=10.0 min UI Adjusted CN=70 Runoff=0.77 cfs 0.070 af

Subcatchment E-6: to Northwest Runoff Area=27,749 sf 19.32% Impervious Runoff Depth=1.04"
Flow Length=95' Tc=10.3 min UI Adjusted CN=74 Runoff=0.63 cfs 0.055 af

Reach DP-1: Edmands Road Inflow=0.24 cfs 0.039 af
Outflow=0.24 cfs 0.039 af

Reach DP-2: Northeast Abutter Inflow=1.58 cfs 0.135 af
Outflow=1.58 cfs 0.135 af

Reach DP-3: Southeast Abutter Inflow=0.69 cfs 0.115 af
Outflow=0.69 cfs 0.115 af

Reach DP-4: Southwest Abutter Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: West Abutter Inflow=0.77 cfs 0.070 af
Outflow=0.77 cfs 0.070 af

Reach DP-6: Northwest Abutter Inflow=0.63 cfs 0.055 af
Outflow=0.63 cfs 0.055 af

Total Runoff Area = 8.217 ac Runoff Volume = 0.415 af Average Runoff Depth = 0.61"
88.25% Pervious = 7.251 ac 11.75% Impervious = 0.966 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: to Edmands Road Runoff Area=54,904 sf 8.44% Impervious Runoff Depth=1.01"
Flow Length=267' Tc=12.8 min CN=59 Runoff=1.00 cfs 0.107 af

Subcatchment E-2: to Northeast Runoff Area=75,813 sf 12.44% Impervious Runoff Depth=1.89"
Flow Length=299' Tc=8.8 min CN=72 Runoff=3.45 cfs 0.275 af

Subcatchment E-3: to Southeast Runoff Area=147,246 sf 13.09% Impervious Runoff Depth=1.07"
Flow Length=446' Tc=19.1 min UI Adjusted CN=60 Runoff=2.50 cfs 0.303 af

Subcatchment E-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.22"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.01 cfs 0.003 af

Subcatchment E-5: to West Runoff Area=44,449 sf 6.12% Impervious Runoff Depth=1.74"
Flow Length=252' Tc=10.0 min UI Adjusted CN=70 Runoff=1.77 cfs 0.148 af

Subcatchment E-6: to Northwest Runoff Area=27,749 sf 19.32% Impervious Runoff Depth=2.05"
Flow Length=95' Tc=10.3 min UI Adjusted CN=74 Runoff=1.31 cfs 0.109 af

Reach DP-1: Edmands Road Inflow=1.00 cfs 0.107 af
Outflow=1.00 cfs 0.107 af

Reach DP-2: Northeast Abutter Inflow=3.45 cfs 0.275 af
Outflow=3.45 cfs 0.275 af

Reach DP-3: Southeast Abutter Inflow=2.50 cfs 0.303 af
Outflow=2.50 cfs 0.303 af

Reach DP-4: Southwest Abutter Inflow=0.01 cfs 0.003 af
Outflow=0.01 cfs 0.003 af

Reach DP-5: West Abutter Inflow=1.77 cfs 0.148 af
Outflow=1.77 cfs 0.148 af

Reach DP-6: Northwest Abutter Inflow=1.31 cfs 0.109 af
Outflow=1.31 cfs 0.109 af

Total Runoff Area = 8.217 ac Runoff Volume = 0.944 af Average Runoff Depth = 1.38"
88.25% Pervious = 7.251 ac 11.75% Impervious = 0.966 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: to Edmands Road Runoff Area=54,904 sf 8.44% Impervious Runoff Depth=1.47"
Flow Length=267' Tc=12.8 min CN=59 Runoff=1.57 cfs 0.154 af

Subcatchment E-2: to Northeast Runoff Area=75,813 sf 12.44% Impervious Runoff Depth=2.51"
Flow Length=299' Tc=8.8 min CN=72 Runoff=4.62 cfs 0.364 af

Subcatchment E-3: to Southeast Runoff Area=147,246 sf 13.09% Impervious Runoff Depth=1.54"
Flow Length=446' Tc=19.1 min UI Adjusted CN=60 Runoff=3.83 cfs 0.434 af

Subcatchment E-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.42"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.03 cfs 0.006 af

Subcatchment E-5: to West Runoff Area=44,449 sf 6.12% Impervious Runoff Depth=2.34"
Flow Length=252' Tc=10.0 min UI Adjusted CN=70 Runoff=2.41 cfs 0.199 af

Subcatchment E-6: to Northwest Runoff Area=27,749 sf 19.32% Impervious Runoff Depth=2.69"
Flow Length=95' Tc=10.3 min UI Adjusted CN=74 Runoff=1.73 cfs 0.143 af

Reach DP-1: Edmands Road Inflow=1.57 cfs 0.154 af
Outflow=1.57 cfs 0.154 af

Reach DP-2: Northeast Abutter Inflow=4.62 cfs 0.364 af
Outflow=4.62 cfs 0.364 af

Reach DP-3: Southeast Abutter Inflow=3.83 cfs 0.434 af
Outflow=3.83 cfs 0.434 af

Reach DP-4: Southwest Abutter Inflow=0.03 cfs 0.006 af
Outflow=0.03 cfs 0.006 af

Reach DP-5: West Abutter Inflow=2.41 cfs 0.199 af
Outflow=2.41 cfs 0.199 af

Reach DP-6: Northwest Abutter Inflow=1.73 cfs 0.143 af
Outflow=1.73 cfs 0.143 af

Total Runoff Area = 8.217 ac Runoff Volume = 1.300 af Average Runoff Depth = 1.90"
88.25% Pervious = 7.251 ac 11.75% Impervious = 0.966 ac

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: to Edmands Road Runoff Area=54,904 sf 8.44% Impervious Runoff Depth=2.23"
Flow Length=267' Tc=12.8 min CN=59 Runoff=2.51 cfs 0.234 af

Subcatchment E-2: to Northeast Runoff Area=75,813 sf 12.44% Impervious Runoff Depth=3.49"
Flow Length=299' Tc=8.8 min CN=72 Runoff=6.47 cfs 0.506 af

Subcatchment E-3: to Southeast Runoff Area=147,246 sf 13.09% Impervious Runoff Depth=2.32"
Flow Length=446' Tc=19.1 min UI Adjusted CN=60 Runoff=6.05 cfs 0.655 af

Subcatchment E-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.83"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.09 cfs 0.012 af

Subcatchment E-5: to West Runoff Area=44,449 sf 6.12% Impervious Runoff Depth=3.29"
Flow Length=252' Tc=10.0 min UI Adjusted CN=70 Runoff=3.43 cfs 0.280 af

Subcatchment E-6: to Northwest Runoff Area=27,749 sf 19.32% Impervious Runoff Depth=3.70"
Flow Length=95' Tc=10.3 min UI Adjusted CN=74 Runoff=2.39 cfs 0.196 af

Reach DP-1: Edmands Road Inflow=2.51 cfs 0.234 af
Outflow=2.51 cfs 0.234 af

Reach DP-2: Northeast Abutter Inflow=6.47 cfs 0.506 af
Outflow=6.47 cfs 0.506 af

Reach DP-3: Southeast Abutter Inflow=6.05 cfs 0.655 af
Outflow=6.05 cfs 0.655 af

Reach DP-4: Southwest Abutter Inflow=0.09 cfs 0.012 af
Outflow=0.09 cfs 0.012 af

Reach DP-5: West Abutter Inflow=3.43 cfs 0.280 af
Outflow=3.43 cfs 0.280 af

Reach DP-6: Northwest Abutter Inflow=2.39 cfs 0.196 af
Outflow=2.39 cfs 0.196 af

Total Runoff Area = 8.217 ac Runoff Volume = 1.884 af Average Runoff Depth = 2.75"
88.25% Pervious = 7.251 ac 11.75% Impervious = 0.966 ac

Summary for Subcatchment E-1: to Edmands Road

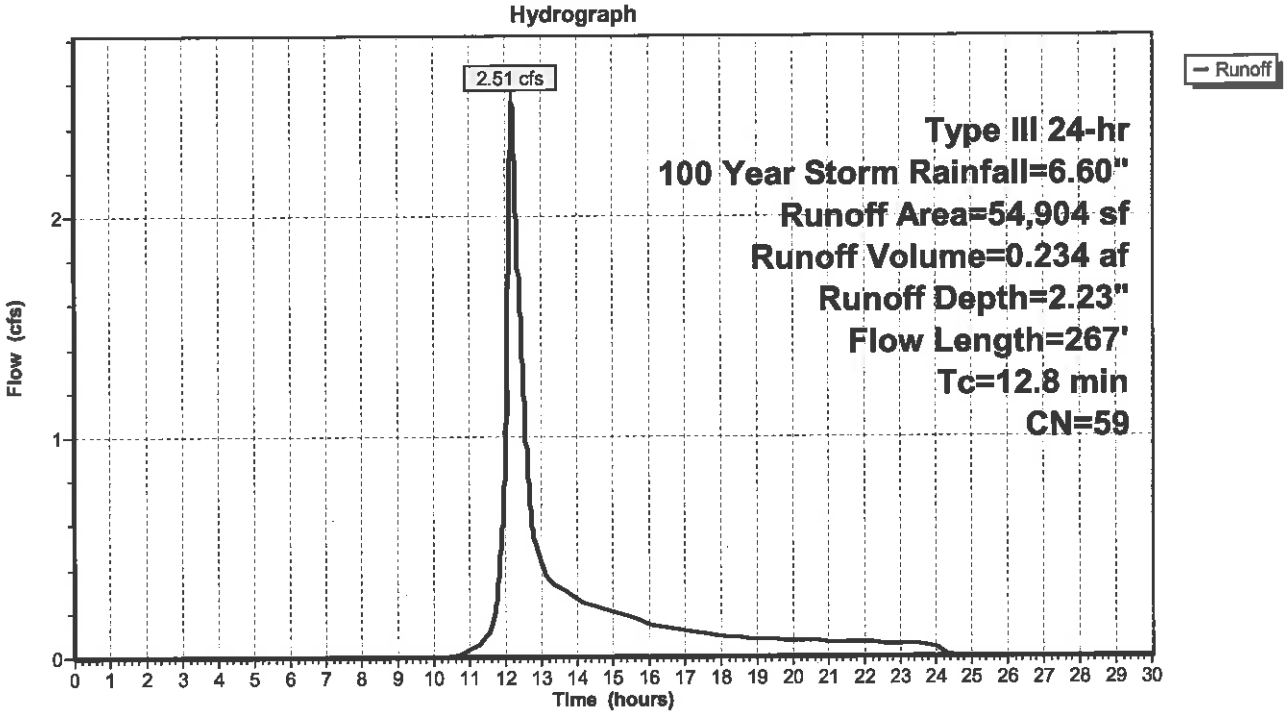
Runoff = 2.51 cfs @ 12.19 hrs, Volume= 0.234 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Description
	2,420	98	Roofs, HSG D
	271	98	Roofs, HSG A
	324	96	Gravel surface, HSG D
	971	96	Gravel surface, HSG A
	6,426	84	50-75% Grass cover, Fair, HSG D
	21,017	49	50-75% Grass cover, Fair, HSG A
	8,472	77	Woods, Good, HSG D
	6,470	30	Woods, Good, HSG A
	480	77	Woods, Good, HSG D
*	1,942	98	Paved parking, HSG A OFF-SITE
*	2,527	30	Woods, Good, HSG A OFF-SITE
*	3,584	39	>75% Grass cover, Good, HSG A OFF-SITE
	54,904	59	Weighted Average
	50,271		91.56% Pervious Area
	4,633		8.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	40	0.1000	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.7	100	0.0600	0.61		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.7	127	0.0390	3.18		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.8	267	Total			

Subcatchment E-1: to Edmands Road



Summary for Subcatchment E-2: to Northeast

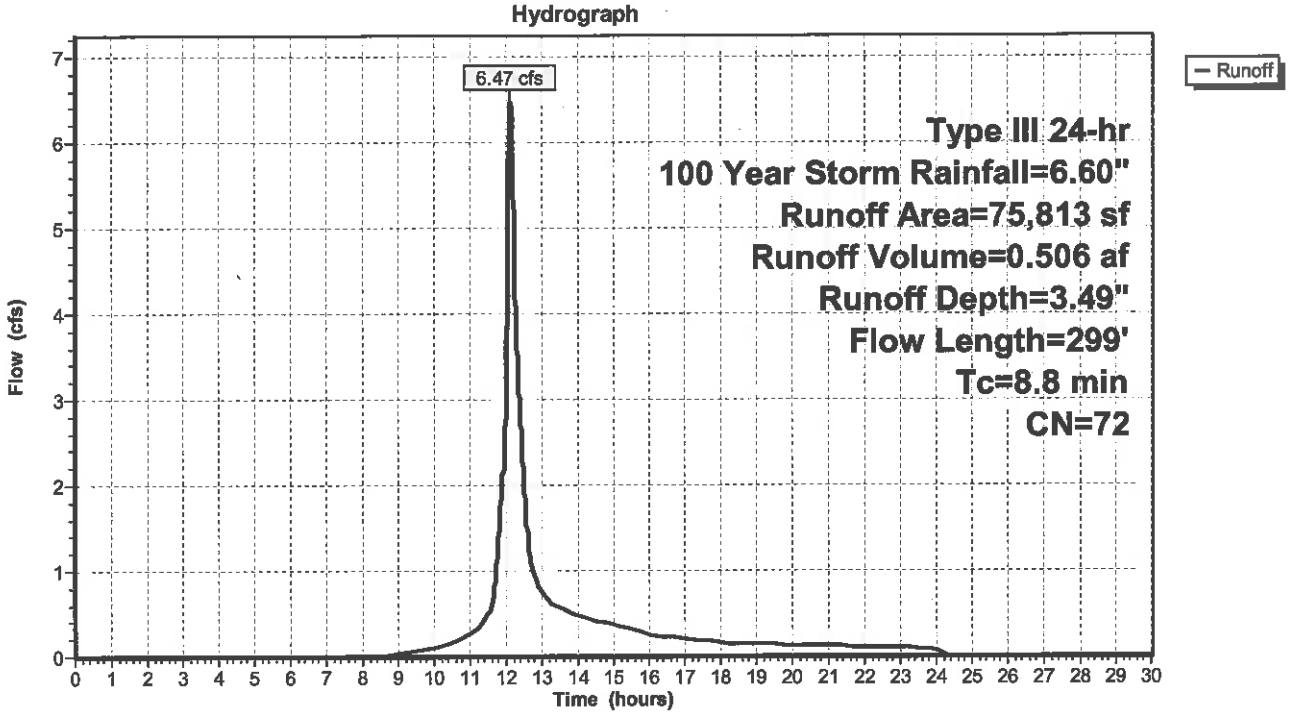
Runoff = 6.47 cfs @ 12.13 hrs, Volume= 0.506 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
9,158	98	Roofs, HSG D
273	98	Roofs, HSG A
612	96	Gravel surface, HSG D
800	96	Gravel surface, HSG A
2,537	80	>75% Grass cover, Good, HSG D
1,181	49	50-75% Grass cover, Fair, HSG A
48,817	77	Woods, Good, HSG D
12,435	30	Woods, Good, HSG A
75,813	72	Weighted Average
66,382		87.56% Pervious Area
9,431		12.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	30	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
4.5	269	0.0390	0.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.8	299	Total			

Subcatchment E-2: to Northeast



Summary for Subcatchment E-3: to Southeast

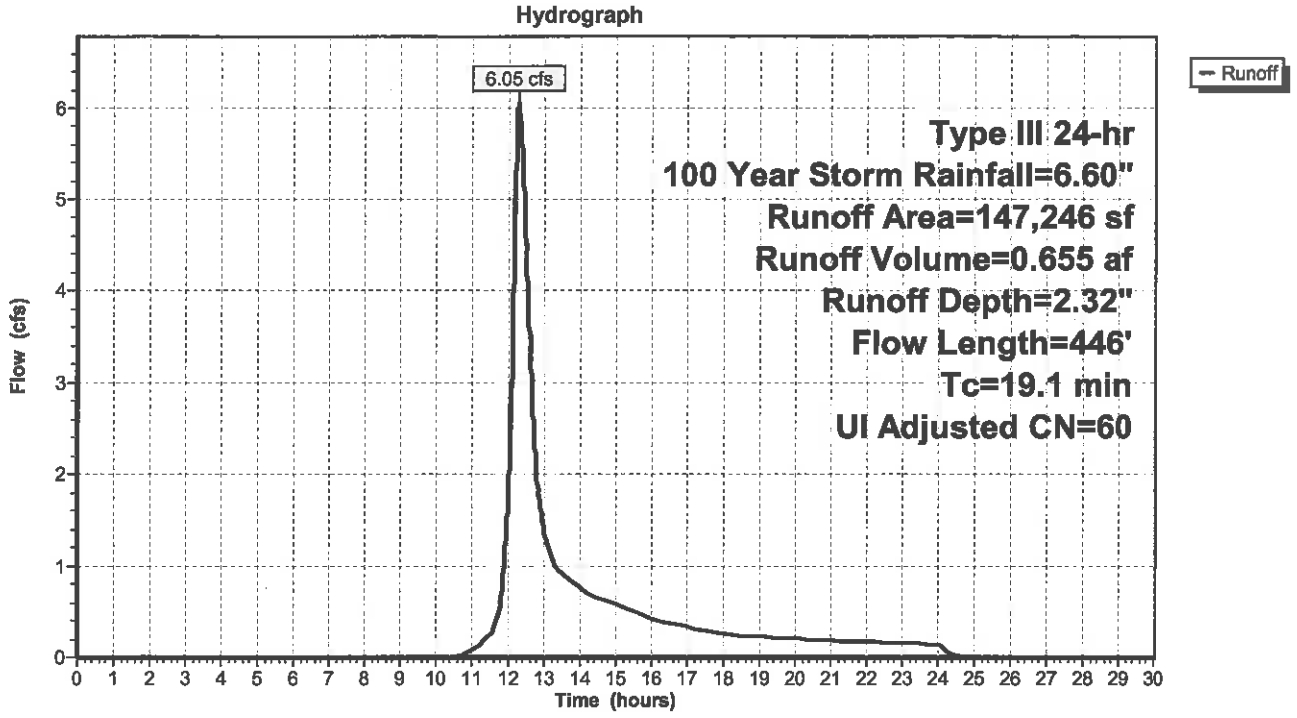
Runoff = 6.05 cfs @ 12.28 hrs, Volume= 0.655 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Adj	Description
	15,424	98		Unconnected pavement, HSG D
	40,368	77		Woods, Good, HSG D
	42,485	30		Woods, Good, HSG A
*	3,852	98		Unconnected pavement, HSG D OFF-SITE
*	34,753	77		Woods, Good, HSG D OFF-SITE
*	10,364	30		Woods, Good, HSG A OFF-SITE
	147,246	63	60	Weighted Average, UI Adjusted
	127,970			86.91% Pervious Area
	19,276			13.09% Impervious Area
	19,276			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.8	396	0.0380	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.1	446	Total			

Subcatchment E-3: to Southeast



Summary for Subcatchment E-4: to Southwest

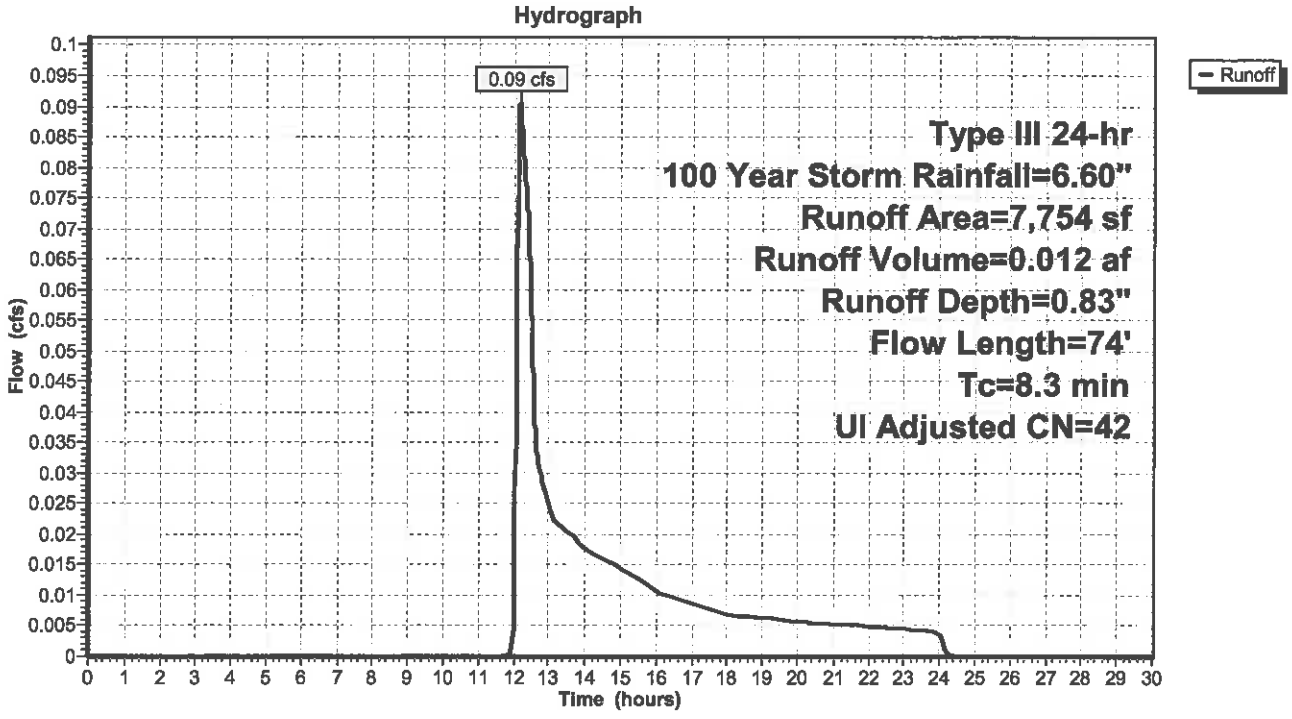
Runoff = 0.09 cfs @ 12.17 hrs, Volume= 0.012 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Adj	Description
636	98		Unconnected roofs, HSG D
1,495	77		Woods, Good, HSG D
5,623	30		Woods, Good, HSG A
7,754	45	42	Weighted Average, UI Adjusted
7,118			91.80% Pervious Area
636			8.20% Impervious Area
636			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	24	0.0420	1.02		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	74	Total			

Subcatchment E-4: to Southwest



Summary for Subcatchment E-5: to West

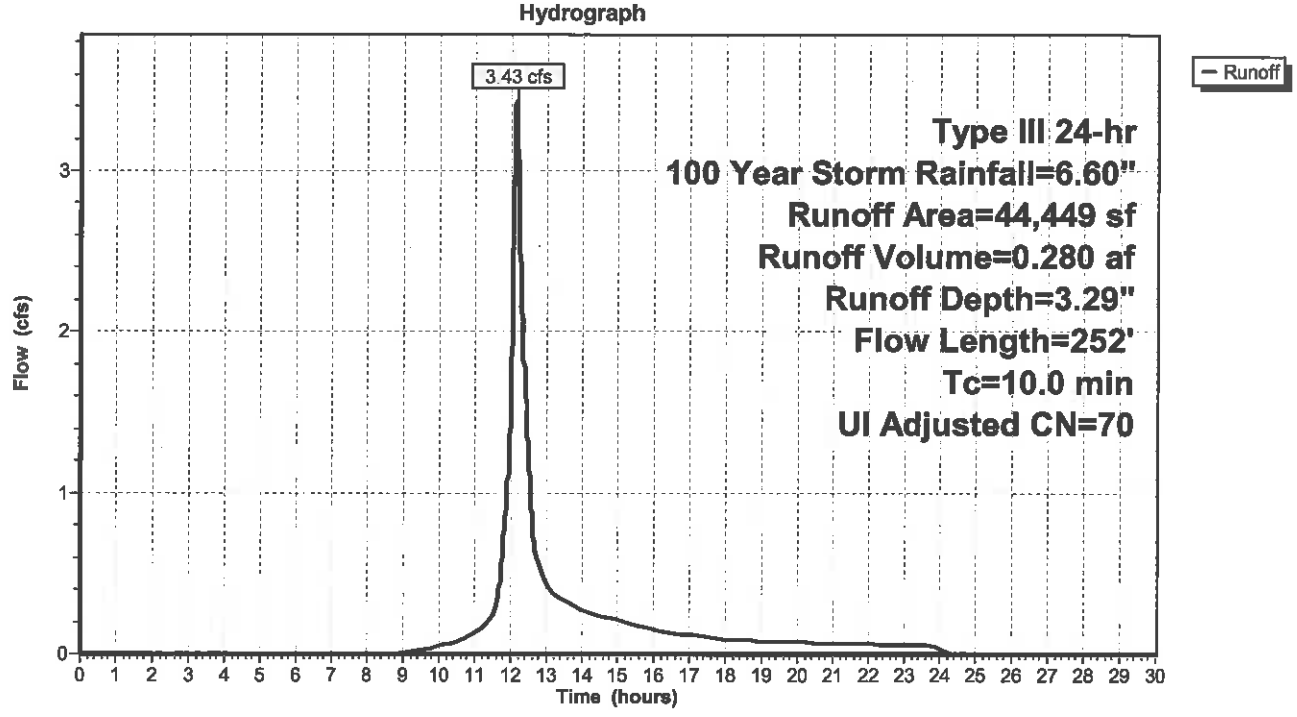
Runoff = 3.43 cfs @ 12.14 hrs, Volume= 0.280 af, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Adj	Description
2,722	98		Unconnected pavement, HSG D
34,392	77		Woods, Good, HSG D
7,335	30		Woods, Good, HSG A
44,449	71	70	Weighted Average, UI Adjusted
41,727			93.88% Pervious Area
2,722			6.12% Impervious Area
2,722			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.9	202	0.0540	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.0	252	Total			

Subcatchment E-5: to West



Summary for Subcatchment E-6: to Northwest

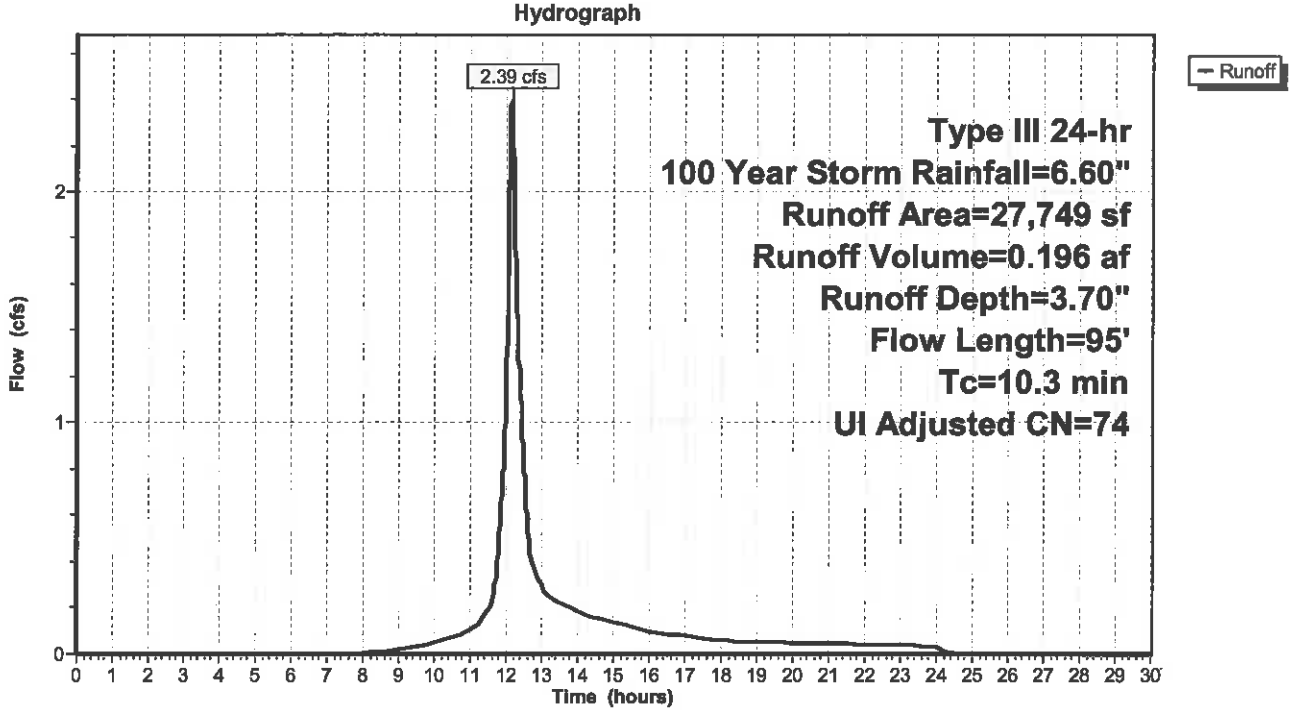
Runoff = 2.39 cfs @ 12.14 hrs, Volume= 0.196 af, Depth= 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Adj	Description
5,360	98		Unconnected pavement, HSG D
19,504	77		Woods, Good, HSG D
2,885	30		Woods, Good, HSG A
27,749	76	74	Weighted Average, UI Adjusted
22,389			80.68% Pervious Area
5,360			19.32% Impervious Area
5,360			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	45	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.3	95	Total			

Subcatchment E-6: to Northwest

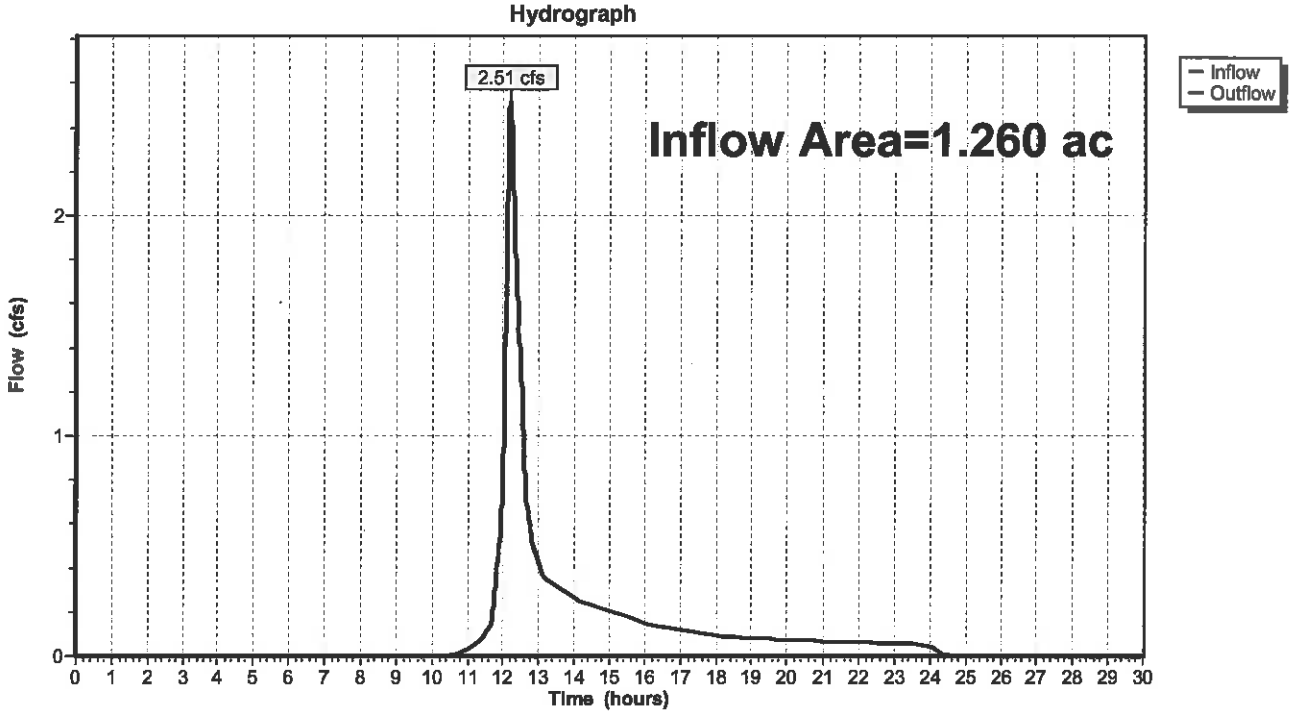


Summary for Reach DP-1: Edmands Road

Inflow Area = 1.260 ac, 8.44% Impervious, Inflow Depth = 2.23" for 100 Year Storm event
Inflow = 2.51 cfs @ 12.19 hrs, Volume= 0.234 af
Outflow = 2.51 cfs @ 12.19 hrs, Volume= 0.234 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-1: Edmands Road

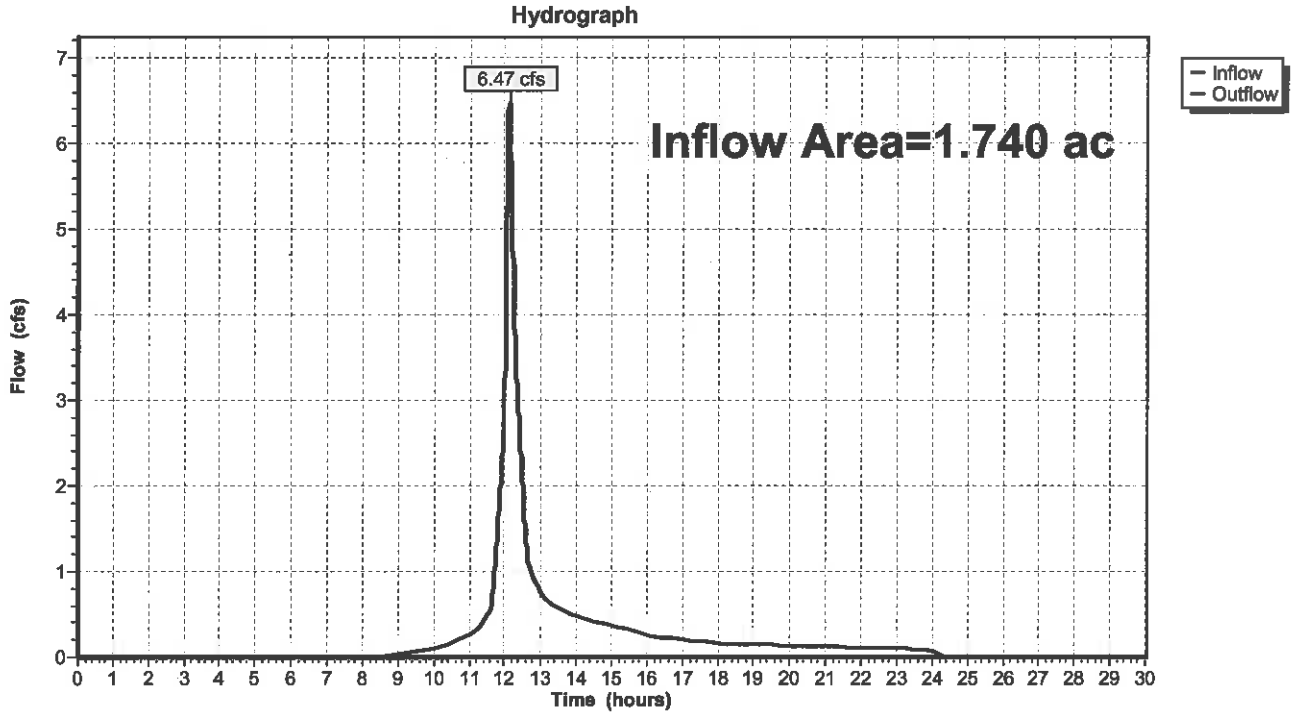


Summary for Reach DP-2: Northeast Abutter

Inflow Area = 1.740 ac, 12.44% Impervious, Inflow Depth = 3.49" for 100 Year Storm event
Inflow = 6.47 cfs @ 12.13 hrs, Volume= 0.506 af
Outflow = 6.47 cfs @ 12.13 hrs, Volume= 0.506 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-2: Northeast Abutter

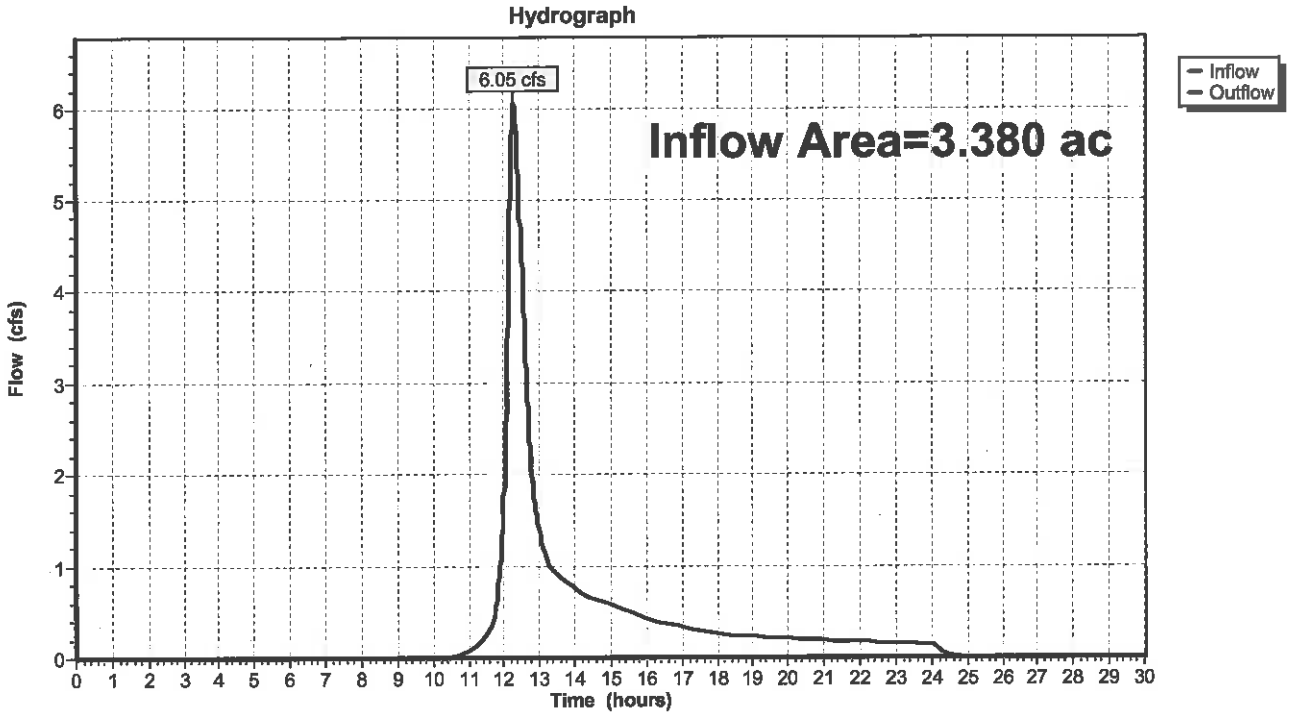


Summary for Reach DP-3: Southeast Abutter

Inflow Area = 3.380 ac, 13.09% Impervious, Inflow Depth = 2.32" for 100 Year Storm event
Inflow = 6.05 cfs @ 12.28 hrs, Volume= 0.655 af
Outflow = 6.05 cfs @ 12.28 hrs, Volume= 0.655 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-3: Southeast Abutter

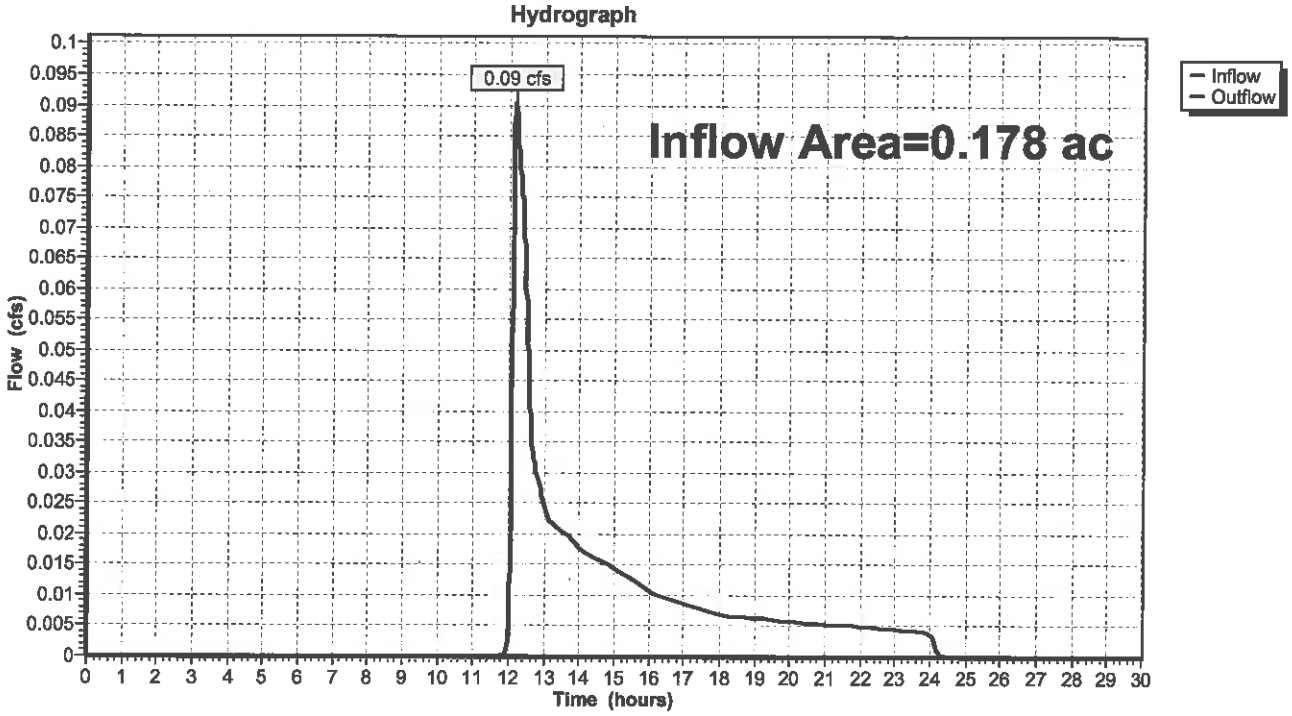


Summary for Reach DP-4: Southwest Abutter

Inflow Area = 0.178 ac, 8.20% Impervious, Inflow Depth = 0.83" for 100 Year Storm event
Inflow = 0.09 cfs @ 12.17 hrs, Volume= 0.012 af
Outflow = 0.09 cfs @ 12.17 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-4: Southwest Abutter

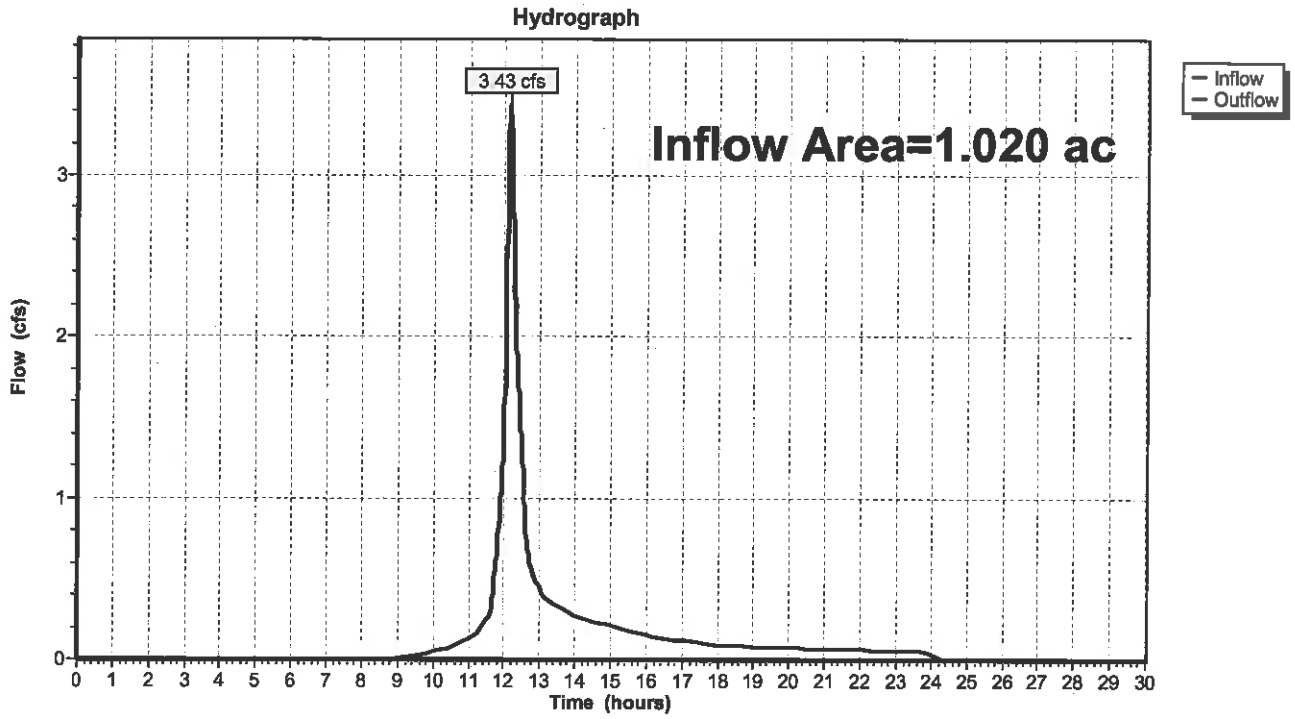


Summary for Reach DP-5: West Abutter

Inflow Area = 1.020 ac, 6.12% Impervious, Inflow Depth = 3.29" for 100 Year Storm event
Inflow = 3.43 cfs @ 12.14 hrs, Volume= 0.280 af
Outflow = 3.43 cfs @ 12.14 hrs, Volume= 0.280 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-5: West Abutter

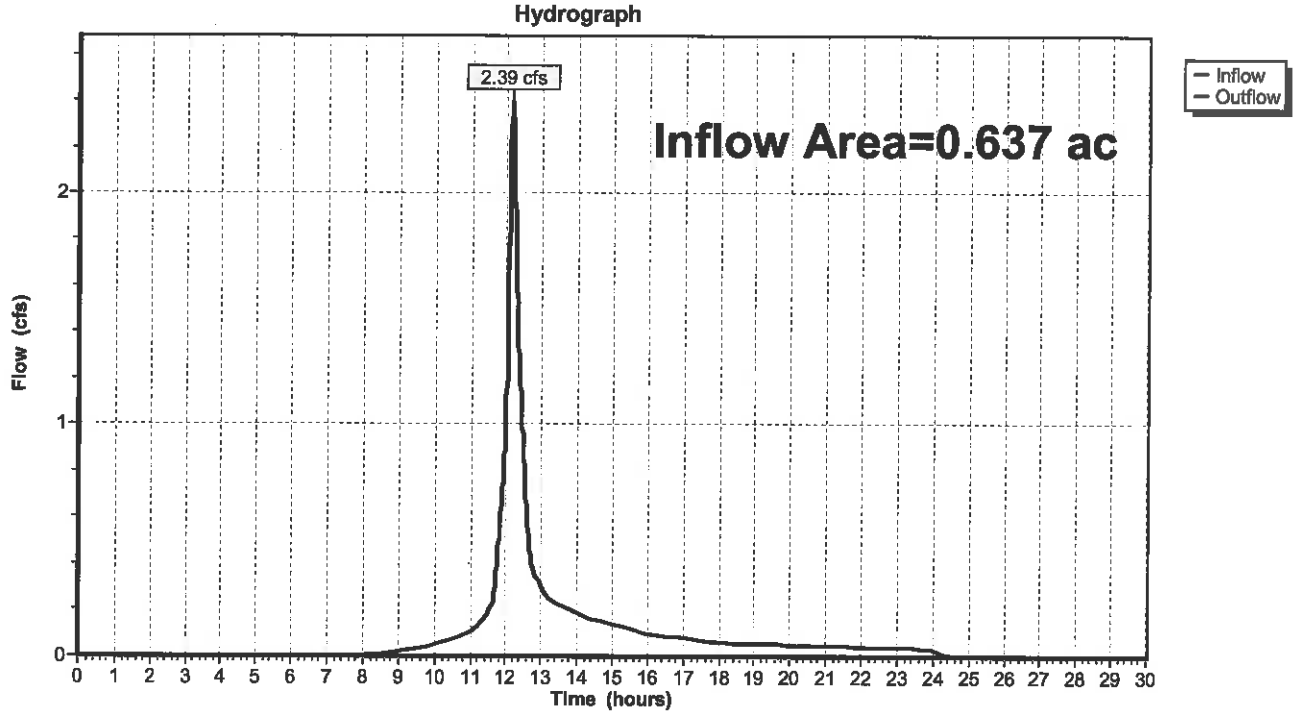


Summary for Reach DP-6: Northwest Abutter

Inflow Area = 0.637 ac, 19.32% Impervious, Inflow Depth = 3.70" for 100 Year Storm event
Inflow = 2.39 cfs @ 12.14 hrs, Volume= 0.196 af
Outflow = 2.39 cfs @ 12.14 hrs, Volume= 0.196 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

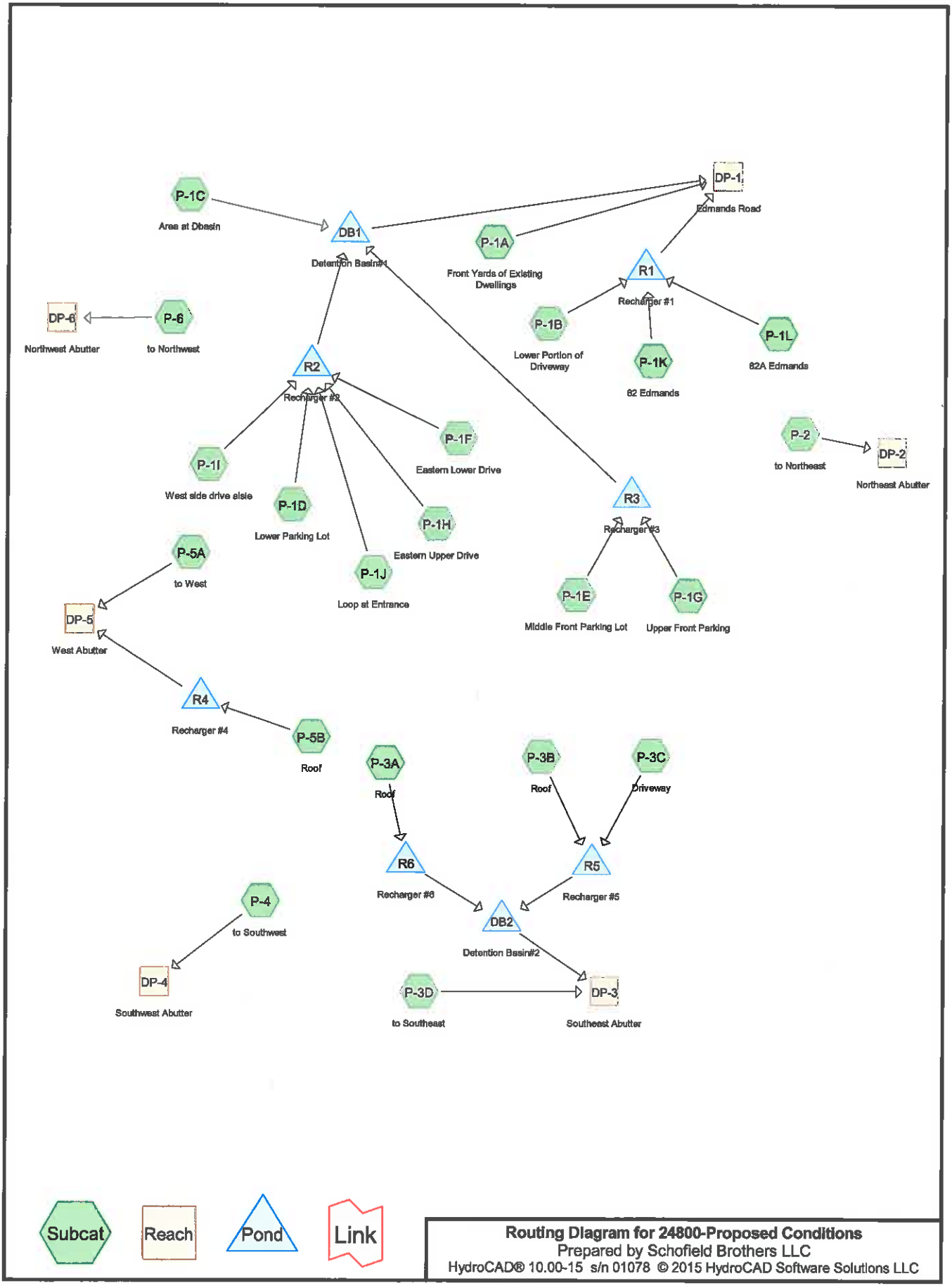
Reach DP-6: Northwest Abutter



24800

SECTION 4

Proposed Conditions Stormwater Model showing Stormwater Flows and Flood Routing Computations using HydroCAD version 10.00



Routing Diagram for 24800-Proposed Conditions
Prepared by Schofield Brothers LLC
HydroCAD® 10.00-15 s/n 01078 © 2015 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.546	39	>75% Grass cover, Good, HSG A (P-1A, P-1B, P-1C, P-1D, P-1E, P-1F, P-1H, P-1I, P-2, P-3C, P-3D, P-5A, P-6)
0.140	39	>75% Grass cover, Good, HSG A Off Site (P-1A, P-1C)
1.408	80	>75% Grass cover, Good, HSG D (P-1A, P-1B, P-1C, P-1D, P-1E, P-1F, P-1G, P-1H, P-1I, P-1J, P-2, P-3C, P-3D, P-5A, P-6)
0.018	96	Gravel surface, HSG A (P-2)
0.021	96	Gravel surface, HSG D (P-1B, P-2)
0.613	98	Paved parking, HSG A (P-1A, P-1B, P-1D, P-1E, P-1F, P-1G, P-1H, P-1I, P-2, P-3C, P-3D)
0.045	98	Paved parking, HSG A Off Site (P-1A, P-1C)
1.489	98	Paved parking, HSG D (P-1A, P-1B, P-1D, P-1E, P-1F, P-1G, P-1H, P-1I, P-1J, P-2, P-3C, P-3D)
0.011	98	Paved parking, HSG D Off Site (P-1C)
0.010	98	Roofs, HSG A (P-1L)
0.862	98	Roofs, HSG D (P-1K, P-1L, P-3A, P-3B, P-5B)
0.088	98	Unconnected pavement, HSG D OFF-SITE (Ledge) (P-3D)
0.310	98	Unconnected pavement, HSG D (Ledge) (P-1A, P-1B, P-1J, P-2, P-3C, P-3D, P-4, P-5A, P-6)
0.394	30	Woods, Good, HSG A (P-3D, P-4, P-5A)
0.465	77	Woods, Good, HSG D (P-4, P-5A, P-6)
0.797	77	Woods, Good, HSG D OFF-SITE (P-3D)
8.217	**76**	**TOTAL AREA**

Time span=0.00-42.00 hrs, dt=0.01 hrs, 4201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1A: Front Yards of Runoff Area=17,736 sf 8.56% Impervious Runoff Depth=0.04"
Tc=5.0 min UI Adjusted CN=52 Runoff=0.00 cfs 0.001 af

Subcatchment P-1B: Lower Portion of Runoff Area=11,233 sf 57.22% Impervious Runoff Depth=1.38"
Tc=5.0 min CN=88 Runoff=0.43 cfs 0.030 af

Subcatchment P-1C: Area at Dbasin Runoff Area=20,715 sf 9.72% Impervious Runoff Depth=0.02"
Tc=5.0 min CN=49 Runoff=0.00 cfs 0.001 af

Subcatchment P-1D: Lower Parking Lot Runoff Area=11,111 sf 87.79% Impervious Runoff Depth=1.96"
Tc=5.0 min CN=95 Runoff=0.58 cfs 0.042 af

Subcatchment P-1E: Middle Front Parking Runoff Area=18,121 sf 91.06% Impervious Runoff Depth=2.06"
Tc=5.0 min CN=96 Runoff=0.99 cfs 0.071 af

Subcatchment P-1F: Eastern Lower Drive Runoff Area=2,594 sf 86.47% Impervious Runoff Depth=1.78"
Tc=5.0 min CN=93 Runoff=0.13 cfs 0.009 af

Subcatchment P-1G: Upper Front Parking Runoff Area=12,047 sf 87.13% Impervious Runoff Depth=2.06"
Tc=5.0 min CN=96 Runoff=0.66 cfs 0.048 af

Subcatchment P-1H: Eastern Upper Drive Runoff Area=10,974 sf 80.04% Impervious Runoff Depth=1.87"
Tc=5.0 min CN=94 Runoff=0.56 cfs 0.039 af

Subcatchment P-1I: West side drive aisle Runoff Area=6,337 sf 84.63% Impervious Runoff Depth=1.87"
Tc=5.0 min CN=94 Runoff=0.32 cfs 0.023 af

Subcatchment P-1J: Loop at Entrance Runoff Area=5,450 sf 57.65% Impervious Runoff Depth=1.53"
Tc=5.0 min CN=90 Runoff=0.23 cfs 0.016 af

Subcatchment P-1K: 82 Edmands Runoff Area=1,090 sf 100.00% Impervious Runoff Depth=2.27"
Tc=5.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment P-1L: 82A Edmands Runoff Area=655 sf 100.00% Impervious Runoff Depth=2.27"
Tc=5.0 min CN=98 Runoff=0.04 cfs 0.003 af

Subcatchment P-2: to Northeast Runoff Area=19,656 sf 7.80% Impervious Runoff Depth=0.24"
Tc=5.0 min UI Adjusted CN=63 Runoff=0.05 cfs 0.009 af

Subcatchment P-3A: Roof Runoff Area=15,795 sf 100.00% Impervious Runoff Depth=2.27"
Tc=5.0 min CN=98 Runoff=0.90 cfs 0.069 af

Subcatchment P-3B: Roof Runoff Area=13,082 sf 100.00% Impervious Runoff Depth=2.27"
Tc=5.0 min CN=98 Runoff=0.75 cfs 0.057 af

Subcatchment P-3C: Driveway Runoff Area=40,906 sf 74.74% Impervious Runoff Depth=1.53"
Tc=5.0 min CN=90 Runoff=1.74 cfs 0.120 af

Subcatchment P-3D: to Southeast Runoff Area=83,980 sf 11.18% Impervious Runoff Depth=0.20"
Flow Length=524' Tc=10.4 min UI Adjusted CN=61 Runoff=0.15 cfs 0.031 af

Subcatchment P-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.00"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment P-5A: to West Runoff Area=39,816 sf 6.31% Impervious Runoff Depth=0.49"
Flow Length=235' Tc=10.2 min UI Adjusted CN=71 Runoff=0.36 cfs 0.037 af

Subcatchment P-5B: Roof Runoff Area=7,338 sf 100.00% Impervious Runoff Depth=2.27"
Tc=5.0 min CN=98 Runoff=0.42 cfs 0.032 af

Subcatchment P-6: to Northwest Runoff Area=11,525 sf 4.00% Impervious Runoff Depth=0.69"
Tc=5.0 min UI Adjusted CN=76 Runoff=0.20 cfs 0.015 af

Reach DP-1: Edmands Road Avg. Flow Depth=0.02' Max Vel=0.63 fps Inflow=0.01 cfs 0.008 af
n=0.030 L=20.0' S=0.0650 '/' Capacity=20.15 cfs Outflow=0.01 cfs 0.008 af

Reach DP-2: Northeast Abutter Inflow=0.05 cfs 0.009 af
Outflow=0.05 cfs 0.009 af

Reach DP-3: Southeast Abutter Avg. Flow Depth=0.02' Max Vel=0.88 fps Inflow=0.16 cfs 0.078 af
n=0.030 L=20.0' S=0.0750 '/' Capacity=108.67 cfs Outflow=0.16 cfs 0.078 af

Reach DP-4: Southwest Abutter Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: West Abutter Inflow=0.36 cfs 0.037 af
Outflow=0.36 cfs 0.037 af

Reach DP-6: Northwest Abutter Inflow=0.20 cfs 0.015 af
Outflow=0.20 cfs 0.015 af

Pond DB1: Detention Basin#1 Peak Elev=241.67' Storage=4,454 cf Inflow=1.88 cfs 0.104 af
Outflow=0.01 cfs 0.006 af

Pond DB2: Detention Basin#2 Peak Elev=240.53' Storage=3,029 cf Inflow=1.18 cfs 0.082 af
Outflow=0.02 cfs 0.046 af

Pond R1: Recharger #1 Peak Elev=237.64' Storage=391 cf Inflow=0.53 cfs 0.037 af
Discarded=0.11 cfs 0.037 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.037 af

Pond R2: Recharger #2 Peak Elev=245.95' Storage=2,078 cf Inflow=1.82 cfs 0.128 af
Discarded=0.03 cfs 0.080 af Primary=0.87 cfs 0.048 af Outflow=0.90 cfs 0.128 af

Pond R3: Recharger #3 Peak Elev=248.95' Storage=1,694 cf Inflow=1.64 cfs 0.119 af
Discarded=0.02 cfs 0.064 af Primary=1.13 cfs 0.055 af Outflow=1.16 cfs 0.119 af

Pond R4: Recharger #4 Peak Elev=255.68' Storage=575 cf Inflow=0.42 cfs 0.032 af
Discarded=0.03 cfs 0.032 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.032 af

Pond R5: Recharger #5 Peak Elev=244.18' Storage=2,840 cf Inflow=2.49 cfs 0.177 af
Discarded=0.03 cfs 0.090 af Primary=1.18 cfs 0.076 af Outflow=1.21 cfs 0.166 af

Pond R6: Recharger #6 Peak Elev=250.84' Storage=1,336 cf Inflow=0.90 cfs 0.069 af
Discarded=0.03 cfs 0.062 af Primary=0.09 cfs 0.006 af Outflow=0.12 cfs 0.069 af

Total Runoff Area = 8.217 ac Runoff Volume = 0.657 af Average Runoff Depth = 0.96"
58.28% Pervious = 4.789 ac 41.72% Impervious = 3.428 ac

Time span=0.00-42.00 hrs, dt=0.01 hrs, 4201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1A: Front Yards of Runoff Area=17,736 sf 8.56% Impervious Runoff Depth=0.17"
Tc=5.0 min UI Adjusted CN=52 Runoff=0.02 cfs 0.006 af

Subcatchment P-1B: Lower Portion of Runoff Area=11,233 sf 57.22% Impervious Runoff Depth=2.00"
Tc=5.0 min CN=88 Runoff=0.62 cfs 0.043 af

Subcatchment P-1C: Area at Dbasin Runoff Area=20,715 sf 9.72% Impervious Runoff Depth=0.11"
Tc=5.0 min CN=49 Runoff=0.01 cfs 0.004 af

Subcatchment P-1D: Lower Parking Lot Runoff Area=11,111 sf 87.79% Impervious Runoff Depth=2.64"
Tc=5.0 min CN=95 Runoff=0.77 cfs 0.056 af

Subcatchment P-1E: Middle Front Parking Runoff Area=18,121 sf 91.06% Impervious Runoff Depth=2.75"
Tc=5.0 min CN=96 Runoff=1.29 cfs 0.095 af

Subcatchment P-1F: Eastern Lower Drive Runoff Area=2,594 sf 86.47% Impervious Runoff Depth=2.45"
Tc=5.0 min CN=93 Runoff=0.17 cfs 0.012 af

Subcatchment P-1G: Upper Front Parking Runoff Area=12,047 sf 87.13% Impervious Runoff Depth=2.75"
Tc=5.0 min CN=96 Runoff=0.86 cfs 0.063 af

Subcatchment P-1H: Eastern Upper Drive Runoff Area=10,974 sf 80.04% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=94 Runoff=0.75 cfs 0.053 af

Subcatchment P-1I: West side drive aisle Runoff Area=6,337 sf 84.63% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=94 Runoff=0.43 cfs 0.031 af

Subcatchment P-1J: Loop at Entrance Runoff Area=5,450 sf 57.65% Impervious Runoff Depth=2.17"
Tc=5.0 min CN=90 Runoff=0.33 cfs 0.023 af

Subcatchment P-1K: 82 Edmands Runoff Area=1,090 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=0.08 cfs 0.006 af

Subcatchment P-1L: 82A Edmands Runoff Area=655 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=0.05 cfs 0.004 af

Subcatchment P-2: to Northeast Runoff Area=19,656 sf 7.80% Impervious Runoff Depth=0.52"
Tc=5.0 min UI Adjusted CN=63 Runoff=0.20 cfs 0.020 af

Subcatchment P-3A: Roof Runoff Area=15,795 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=1.17 cfs 0.090 af

Subcatchment P-3B: Roof Runoff Area=13,082 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=0.97 cfs 0.074 af

Subcatchment P-3C: Driveway Runoff Area=40,906 sf 74.74% Impervious Runoff Depth=2.17"
Tc=5.0 min CN=90 Runoff=2.45 cfs 0.170 af

Subcatchment P-3D: to Southeast Runoff Area=83,980 sf 11.18% Impervious Runoff Depth=0.44"
Flow Length=524' Tc=10.4 min UI Adjusted CN=61 Runoff=0.53 cfs 0.071 af

Subcatchment P-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.01"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment P-5A: to West Runoff Area=39,816 sf 6.31% Impervious Runoff Depth=0.88"
Flow Length=235' Tc=10.2 min UI Adjusted CN=71 Runoff=0.74 cfs 0.067 af

Subcatchment P-5B: Roof Runoff Area=7,338 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=0.54 cfs 0.042 af

Subcatchment P-6: to Northwest Runoff Area=11,525 sf 4.00% Impervious Runoff Depth=1.15"
Tc=5.0 min UI Adjusted CN=76 Runoff=0.36 cfs 0.025 af

Reach DP-1: Edmands Road Avg. Flow Depth=0.05' Max Vel=1.36 fps Inflow=0.16 cfs 0.094 af
n=0.030 L=20.0' S=0.0650 '/' Capacity=20.15 cfs Outflow=0.16 cfs 0.094 af

Reach DP-2: Northeast Abutter Inflow=0.20 cfs 0.020 af
Outflow=0.20 cfs 0.020 af

Reach DP-3: Southeast Abutter Avg. Flow Depth=0.04' Max Vel=1.28 fps Inflow=0.55 cfs 0.142 af
n=0.030 L=20.0' S=0.0750 '/' Capacity=108.67 cfs Outflow=0.55 cfs 0.142 af

Reach DP-4: Southwest Abutter Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: West Abutter Inflow=0.74 cfs 0.067 af
Outflow=0.74 cfs 0.067 af

Reach DP-6: Northwest Abutter Inflow=0.36 cfs 0.025 af
Outflow=0.36 cfs 0.025 af

Pond DB1: Detention Basin#1 Peak Elev=242.11' Storage=5,883 cf Inflow=4.00 cfs 0.186 af
Outflow=0.15 cfs 0.088 af

Pond DB2: Detention Basin#2 Peak Elev=241.26' Storage=6,077 cf Inflow=2.98 cfs 0.162 af
Outflow=0.03 cfs 0.071 af

Pond R1: Recharger #1 Peak Elev=238.34' Storage=686 cf Inflow=0.75 cfs 0.053 af
Discarded=0.11 cfs 0.053 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.053 af

Pond R2: Recharger #2 Peak Elev=246.16' Storage=2,230 cf Inflow=2.45 cfs 0.175 af
Discarded=0.03 cfs 0.084 af Primary=2.17 cfs 0.091 af Outflow=2.20 cfs 0.175 af

Pond R3: Recharger #3 Peak Elev=249.14' Storage=1,834 cf Inflow=2.15 cfs 0.159 af
Discarded=0.02 cfs 0.067 af Primary=1.83 cfs 0.091 af Outflow=1.85 cfs 0.159 af

Pond R4: Recharger #4 Peak Elev=255.96' Storage=830 cf Inflow=0.54 cfs 0.042 af
Discarded=0.03 cfs 0.042 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.042 af

Pond R5: Recharger #5 Peak Elev=244.46' Storage=3,085 cf Inflow=3.41 cfs 0.244 af
Discarded=0.03 cfs 0.093 af Primary=2.98 cfs 0.140 af Outflow=3.01 cfs 0.233 af

Pond R6: Recharger #6 Peak Elev=250.92' Storage=1,411 cf Inflow=1.17 cfs 0.090 af
Discarded=0.03 cfs 0.068 af Primary=0.48 cfs 0.022 af Outflow=0.52 cfs 0.090 af

Total Runoff Area = 8.217 ac Runoff Volume = 0.956 af Average Runoff Depth = 1.40"
58.28% Pervious = 4.789 ac 41.72% Impervious = 3.428 ac

Time span=0.00-42.00 hrs, dt=0.01 hrs, 4201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1A: Front Yards of Runoff Area=17,736 sf 8.56% Impervious Runoff Depth=0.63"
Tc=5.0 min UI Adjusted CN=52 Runoff=0.20 cfs 0.021 af

Subcatchment P-1B: Lower Portion of Runoff Area=11,233 sf 57.22% Impervious Runoff Depth=3.29"
Tc=5.0 min CN=88 Runoff=1.01 cfs 0.071 af

Subcatchment P-1C: Area at Dbasin Runoff Area=20,715 sf 9.72% Impervious Runoff Depth=0.49"
Tc=5.0 min CN=49 Runoff=0.13 cfs 0.019 af

Subcatchment P-1D: Lower Parking Lot Runoff Area=11,111 sf 87.79% Impervious Runoff Depth=4.02"
Tc=5.0 min CN=95 Runoff=1.15 cfs 0.086 af

Subcatchment P-1E: Middle Front Parking Runoff Area=18,121 sf 91.06% Impervious Runoff Depth=4.14"
Tc=5.0 min CN=96 Runoff=1.90 cfs 0.143 af

Subcatchment P-1F: Eastern Lower Drive Runoff Area=2,594 sf 86.47% Impervious Runoff Depth=3.81"
Tc=5.0 min CN=93 Runoff=0.26 cfs 0.019 af

Subcatchment P-1G: Upper Front Parking Runoff Area=12,047 sf 87.13% Impervious Runoff Depth=4.14"
Tc=5.0 min CN=96 Runoff=1.26 cfs 0.095 af

Subcatchment P-1H: Eastern Upper Drive Runoff Area=10,974 sf 80.04% Impervious Runoff Depth=3.91"
Tc=5.0 min CN=94 Runoff=1.12 cfs 0.082 af

Subcatchment P-1I: West side drive aisle Runoff Area=6,337 sf 84.63% Impervious Runoff Depth=3.91"
Tc=5.0 min CN=94 Runoff=0.65 cfs 0.047 af

Subcatchment P-1J: Loop at Entrance Runoff Area=5,450 sf 57.65% Impervious Runoff Depth=3.49"
Tc=5.0 min CN=90 Runoff=0.51 cfs 0.036 af

Subcatchment P-1K: 82 Edmands Runoff Area=1,090 sf 100.00% Impervious Runoff Depth=4.36"
Tc=5.0 min CN=98 Runoff=0.12 cfs 0.009 af

Subcatchment P-1L: 82A Edmands Runoff Area=655 sf 100.00% Impervious Runoff Depth=4.36"
Tc=5.0 min CN=98 Runoff=0.07 cfs 0.005 af

Subcatchment P-2: to Northeast Runoff Area=19,656 sf 7.80% Impervious Runoff Depth=1.26"
Tc=5.0 min UI Adjusted CN=63 Runoff=0.63 cfs 0.047 af

Subcatchment P-3A: Roof Runoff Area=15,795 sf 100.00% Impervious Runoff Depth=4.36"
Tc=5.0 min CN=98 Runoff=1.69 cfs 0.132 af

Subcatchment P-3B: Roof Runoff Area=13,082 sf 100.00% Impervious Runoff Depth=4.36"
Tc=5.0 min CN=98 Runoff=1.40 cfs 0.109 af

Subcatchment P-3C: Driveway Runoff Area=40,906 sf 74.74% Impervious Runoff Depth=3.49"
Tc=5.0 min CN=90 Runoff=3.86 cfs 0.273 af

Subcatchment P-3D: to Southeast Runoff Area=83,980 sf 11.18% Impervious Runoff Depth=1.14"
Flow Length=524' Tc=10.4 min UI Adjusted CN=61 Runoff=1.93 cfs 0.182 af

Subcatchment P-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.22"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.01 cfs 0.003 af

Subcatchment P-5A: to West Runoff Area=39,816 sf 6.31% Impervious Runoff Depth=1.82"
Flow Length=235' Tc=10.2 min UI Adjusted CN=71 Runoff=1.65 cfs 0.139 af

Subcatchment P-5B: Roof Runoff Area=7,338 sf 100.00% Impervious Runoff Depth=4.36"
Tc=5.0 min CN=98 Runoff=0.78 cfs 0.061 af

Subcatchment P-6: to Northwest Runoff Area=11,525 sf 4.00% Impervious Runoff Depth=2.21"
Tc=5.0 min UI Adjusted CN=76 Runoff=0.71 cfs 0.049 af

Reach DP-1: Edmands Road Avg. Flow Depth=0.11' Max Vel=2.18 fps Inflow=0.73 cfs 0.302 af
n=0.030 L=20.0' S=0.0650 '/' Capacity=20.15 cfs Outflow=0.73 cfs 0.302 af

Reach DP-2: Northeast Abutter Inflow=0.63 cfs 0.047 af
Outflow=0.63 cfs 0.047 af

Reach DP-3: Southeast Abutter Avg. Flow Depth=0.08' Max Vel=1.90 fps Inflow=1.96 cfs 0.391 af
n=0.030 L=20.0' S=0.0750 '/' Capacity=108.67 cfs Outflow=1.96 cfs 0.391 af

Reach DP-4: Southwest Abutter Inflow=0.01 cfs 0.003 af
Outflow=0.01 cfs 0.003 af

Reach DP-5: West Abutter Inflow=1.65 cfs 0.143 af
Outflow=1.65 cfs 0.143 af

Reach DP-6: Northwest Abutter Inflow=0.71 cfs 0.049 af
Outflow=0.71 cfs 0.049 af

Pond DB1: Detention Basin#1 Peak Elev=243.18' Storage=9,860 cf Inflow=6.12 cfs 0.368 af
Outflow=0.48 cfs 0.269 af

Pond DB2: Detention Basin#2 Peak Elev=242.10' Storage=9,583 cf Inflow=6.43 cfs 0.329 af
Outflow=0.32 cfs 0.209 af

Pond R1: Recharger #1 Peak Elev=239.15' Storage=985 cf Inflow=1.20 cfs 0.085 af
Discarded=0.11 cfs 0.074 af Primary=0.37 cfs 0.011 af Outflow=0.48 cfs 0.085 af

Pond R2: Recharger #2 Peak Elev=246.45' Storage=2,408 cf Inflow=3.69 cfs 0.270 af
Discarded=0.03 cfs 0.088 af Primary=3.33 cfs 0.182 af Outflow=3.36 cfs 0.270 af

Pond R3: Recharger #3 Peak Elev=249.40' Storage=2,025 cf Inflow=3.17 cfs 0.239 af
Discarded=0.02 cfs 0.072 af Primary=2.67 cfs 0.167 af Outflow=2.70 cfs 0.239 af

Pond R4: Recharger #4 Peak Elev=256.49' Storage=1,284 cf Inflow=0.78 cfs 0.061 af
Discarded=0.03 cfs 0.057 af Primary=0.03 cfs 0.004 af Outflow=0.05 cfs 0.061 af

Pond R5: Recharger #5 Peak Elev=244.72' Storage=3,314 cf Inflow=5.26 cfs 0.382 af
Discarded=0.03 cfs 0.097 af Primary=4.87 cfs 0.274 af Outflow=4.90 cfs 0.371 af

Pond R6: Recharger #6 Peak Elev=251.07' Storage=1,529 cf Inflow=1.69 cfs 0.132 af
Discarded=0.03 cfs 0.076 af Primary=1.56 cfs 0.056 af Outflow=1.60 cfs 0.132 af

Total Runoff Area = 8.217 ac Runoff Volume = 1.631 af Average Runoff Depth = 2.38"
58.28% Pervious = 4.789 ac 41.72% Impervious = 3.428 ac

Time span=0.00-42.00 hrs, dt=0.01 hrs, 4201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1A: Front Yards of Runoff Area=17,736 sf 8.56% Impervious Runoff Depth=0.99"
Tc=5.0 min UI Adjusted CN=52 Runoff=0.38 cfs 0.034 af

Subcatchment P-1B: Lower Portion of Runoff Area=11,233 sf 57.22% Impervious Runoff Depth=4.05"
Tc=5.0 min CN=88 Runoff=1.23 cfs 0.087 af

Subcatchment P-1C: Area at Dbasin Runoff Area=20,715 sf 9.72% Impervious Runoff Depth=0.80"
Tc=5.0 min CN=49 Runoff=0.31 cfs 0.032 af

Subcatchment P-1D: Lower Parking Lot Runoff Area=11,111 sf 87.79% Impervious Runoff Depth=4.82"
Tc=5.0 min CN=95 Runoff=1.36 cfs 0.102 af

Subcatchment P-1E: Middle Front Parking Runoff Area=18,121 sf 91.06% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=96 Runoff=2.25 cfs 0.171 af

Subcatchment P-1F: Eastern Lower Drive Runoff Area=2,594 sf 86.47% Impervious Runoff Depth=4.59"
Tc=5.0 min CN=93 Runoff=0.31 cfs 0.023 af

Subcatchment P-1G: Upper Front Parking Runoff Area=12,047 sf 87.13% Impervious Runoff Depth=4.93"
Tc=5.0 min CN=96 Runoff=1.49 cfs 0.114 af

Subcatchment P-1H: Eastern Upper Drive Runoff Area=10,974 sf 80.04% Impervious Runoff Depth=4.70"
Tc=5.0 min CN=94 Runoff=1.33 cfs 0.099 af

Subcatchment P-1I: West side drive aisle Runoff Area=6,337 sf 84.63% Impervious Runoff Depth=4.70"
Tc=5.0 min CN=94 Runoff=0.77 cfs 0.057 af

Subcatchment P-1J: Loop at Entrance Runoff Area=5,450 sf 57.65% Impervious Runoff Depth=4.26"
Tc=5.0 min CN=90 Runoff=0.62 cfs 0.044 af

Subcatchment P-1K: 82 Edmands Runoff Area=1,090 sf 100.00% Impervious Runoff Depth=5.16"
Tc=5.0 min CN=98 Runoff=0.14 cfs 0.011 af

Subcatchment P-1L: 82A Edmands Runoff Area=655 sf 100.00% Impervious Runoff Depth=5.16"
Tc=5.0 min CN=98 Runoff=0.08 cfs 0.006 af

Subcatchment P-2: to Northeast Runoff Area=19,656 sf 7.80% Impervious Runoff Depth=1.77"
Tc=5.0 min UI Adjusted CN=63 Runoff=0.92 cfs 0.066 af

Subcatchment P-3A: Roof Runoff Area=15,795 sf 100.00% Impervious Runoff Depth=5.16"
Tc=5.0 min CN=98 Runoff=1.99 cfs 0.156 af

Subcatchment P-3B: Roof Runoff Area=13,082 sf 100.00% Impervious Runoff Depth=5.16"
Tc=5.0 min CN=98 Runoff=1.64 cfs 0.129 af

Subcatchment P-3C: Driveway Runoff Area=40,906 sf 74.74% Impervious Runoff Depth=4.26"
Tc=5.0 min CN=90 Runoff=4.67 cfs 0.334 af

Subcatchment P-3D: to Southeast Runoff Area=83,980 sf 11.18% Impervious Runoff Depth=1.62"
Flow Length=524' Tc=10.4 min UI Adjusted CN=61 Runoff=2.91 cfs 0.260 af

Subcatchment P-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.42"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.03 cfs 0.006 af

Subcatchment P-5A: to West Runoff Area=39,816 sf 6.31% Impervious Runoff Depth=2.42"
Flow Length=235' Tc=10.2 min UI Adjusted CN=71 Runoff=2.23 cfs 0.185 af

Subcatchment P-5B: Roof Runoff Area=7,338 sf 100.00% Impervious Runoff Depth=5.16"
Tc=5.0 min CN=98 Runoff=0.92 cfs 0.072 af

Subcatchment P-6: to Northwest Runoff Area=11,525 sf 4.00% Impervious Runoff Depth=2.87"
Tc=5.0 min UI Adjusted CN=76 Runoff=0.92 cfs 0.063 af

Reach DP-1: Edmands Road Avg. Flow Depth=0.14' Max Vel=2.60 fps Inflow=1.30 cfs 0.433 af
n=0.030 L=20.0' S=0.0650 '/' Capacity=20.15 cfs Outflow=1.30 cfs 0.433 af

Reach DP-2: Northeast Abutter Inflow=0.92 cfs 0.066 af
Outflow=0.92 cfs 0.066 af

Reach DP-3: Southeast Abutter Avg. Flow Depth=0.09' Max Vel=2.15 fps Inflow=2.94 cfs 0.565 af
n=0.030 L=20.0' S=0.0750 '/' Capacity=108.67 cfs Outflow=2.94 cfs 0.565 af

Reach DP-4: Southwest Abutter Inflow=0.03 cfs 0.006 af
Outflow=0.03 cfs 0.006 af

Reach DP-5: West Abutter Inflow=2.23 cfs 0.197 af
Outflow=2.23 cfs 0.197 af

Reach DP-6: Northwest Abutter Inflow=0.92 cfs 0.063 af
Outflow=0.92 cfs 0.063 af

Pond DB1: Detention Basin#1 Peak Elev=243.74' Storage=12,301 cf Inflow=7.59 cfs 0.478 af
Outflow=0.70 cfs 0.379 af

Pond DB2: Detention Basin#2 Peak Elev=242.66' Storage=11,919 cf Inflow=7.59 cfs 0.428 af
Outflow=0.46 cfs 0.306 af

Pond R1: Recharger #1 Peak Elev=239.35' Storage=1,043 cf Inflow=1.45 cfs 0.104 af
Discarded=0.11 cfs 0.084 af Primary=0.77 cfs 0.021 af Outflow=0.88 cfs 0.104 af

Pond R2: Recharger #2 Peak Elev=246.65' Storage=2,507 cf Inflow=4.40 cfs 0.325 af
Discarded=0.03 cfs 0.090 af Primary=3.95 cfs 0.235 af Outflow=3.97 cfs 0.325 af

Pond R3: Recharger #3 Peak Elev=249.68' Storage=2,127 cf Inflow=3.74 cfs 0.285 af
Discarded=0.02 cfs 0.073 af Primary=3.34 cfs 0.212 af Outflow=3.36 cfs 0.285 af

Pond R4: Recharger #4 Peak Elev=256.61' Storage=1,386 cf Inflow=0.92 cfs 0.072 af
Discarded=0.03 cfs 0.060 af Primary=0.15 cfs 0.013 af Outflow=0.18 cfs 0.072 af

Pond R5: Recharger #5 Peak Elev=244.87' Storage=3,450 cf Inflow=6.31 cfs 0.463 af
Discarded=0.03 cfs 0.099 af Primary=5.73 cfs 0.352 af Outflow=5.76 cfs 0.451 af

Pond R6: Recharger #6 Peak Elev=251.10' Storage=1,553 cf Inflow=1.99 cfs 0.156 af
Discarded=0.03 cfs 0.080 af Primary=1.88 cfs 0.076 af Outflow=1.91 cfs 0.156 af

Total Runoff Area = 8.217 ac Runoff Volume = 2.051 af Average Runoff Depth = 3.00"
58.28% Pervious = 4.789 ac 41.72% Impervious = 3.428 ac

Time span=0.00-42.00 hrs, dt=0.01 hrs, 4201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1A: Front Yards of Runoff Area=17,736 sf 8.56% Impervious Runoff Depth=1.62"
Tc=5.0 min UI Adjusted CN=52 Runoff=0.70 cfs 0.055 af

Subcatchment P-1B: Lower Portion of Runoff Area=11,233 sf 57.22% Impervious Runoff Depth=5.21"
Tc=5.0 min CN=88 Runoff=1.57 cfs 0.112 af

Subcatchment P-1C: Area at Dbasin Runoff Area=20,715 sf 9.72% Impervious Runoff Depth=1.37"
Tc=5.0 min CN=49 Runoff=0.65 cfs 0.054 af

Subcatchment P-1D: Lower Parking Lot Runoff Area=11,111 sf 87.79% Impervious Runoff Depth=6.01"
Tc=5.0 min CN=95 Runoff=1.68 cfs 0.128 af

Subcatchment P-1E: Middle Front Parking Runoff Area=18,121 sf 91.06% Impervious Runoff Depth=6.13"
Tc=5.0 min CN=96 Runoff=2.76 cfs 0.212 af

Subcatchment P-1F: Eastern Lower Drive Runoff Area=2,594 sf 86.47% Impervious Runoff Depth=5.78"
Tc=5.0 min CN=93 Runoff=0.39 cfs 0.029 af

Subcatchment P-1G: Upper Front Parking Runoff Area=12,047 sf 87.13% Impervious Runoff Depth=6.13"
Tc=5.0 min CN=96 Runoff=1.84 cfs 0.141 af

Subcatchment P-1H: Eastern Upper Drive Runoff Area=10,974 sf 80.04% Impervious Runoff Depth=5.89"
Tc=5.0 min CN=94 Runoff=1.65 cfs 0.124 af

Subcatchment P-1I: West side drive aisle Runoff Area=6,337 sf 84.63% Impervious Runoff Depth=5.89"
Tc=5.0 min CN=94 Runoff=0.95 cfs 0.071 af

Subcatchment P-1J: Loop at Entrance Runoff Area=5,450 sf 57.65% Impervious Runoff Depth=5.43"
Tc=5.0 min CN=90 Runoff=0.78 cfs 0.057 af

Subcatchment P-1K: 82 Edmands Runoff Area=1,090 sf 100.00% Impervious Runoff Depth=6.36"
Tc=5.0 min CN=98 Runoff=0.17 cfs 0.013 af

Subcatchment P-1L: 82A Edmands Runoff Area=655 sf 100.00% Impervious Runoff Depth=6.36"
Tc=5.0 min CN=98 Runoff=0.10 cfs 0.008 af

Subcatchment P-2: to Northeast Runoff Area=19,656 sf 7.80% Impervious Runoff Depth=2.61"
Tc=5.0 min UI Adjusted CN=63 Runoff=1.40 cfs 0.098 af

Subcatchment P-3A: Roof Runoff Area=15,795 sf 100.00% Impervious Runoff Depth=6.36"
Tc=5.0 min CN=98 Runoff=2.43 cfs 0.192 af

Subcatchment P-3B: Roof Runoff Area=13,082 sf 100.00% Impervious Runoff Depth=6.36"
Tc=5.0 min CN=98 Runoff=2.01 cfs 0.159 af

Subcatchment P-3C: Driveway Runoff Area=40,906 sf 74.74% Impervious Runoff Depth=5.43"
Tc=5.0 min CN=90 Runoff=5.87 cfs 0.425 af

Subcatchment P-3D: to Southeast Runoff Area=83,980 sf 11.18% Impervious Runoff Depth=2.42"
Flow Length=524' Tc=10.4 min UI Adjusted CN=61 Runoff=4.54 cfs 0.388 af

Subcatchment P-4: to Southwest Runoff Area=7,754 sf 8.20% Impervious Runoff Depth=0.83"
Flow Length=74' Tc=8.3 min UI Adjusted CN=42 Runoff=0.09 cfs 0.012 af

Subcatchment P-5A: to West Runoff Area=39,816 sf 6.31% Impervious Runoff Depth=3.39"
Flow Length=235' Tc=10.2 min UI Adjusted CN=71 Runoff=3.15 cfs 0.258 af

Subcatchment P-5B: Roof Runoff Area=7,338 sf 100.00% Impervious Runoff Depth=6.36"
Tc=5.0 min CN=98 Runoff=1.13 cfs 0.089 af

Subcatchment P-6: to Northwest Runoff Area=11,525 sf 4.00% Impervious Runoff Depth=3.90"
Tc=5.0 min UI Adjusted CN=76 Runoff=1.25 cfs 0.086 af

Reach DP-1: Edmands Road Avg. Flow Depth=0.19' Max Vel=3.19 fps Inflow=2.50 cfs 0.641 af
n=0.030 L=20.0' S=0.0650 '/' Capacity=20.15 cfs Outflow=2.50 cfs 0.641 af

Reach DP-2: Northeast Abutter Inflow=1.40 cfs 0.098 af
Outflow=1.40 cfs 0.098 af

Reach DP-3: Southeast Abutter Avg. Flow Depth=0.12' Max Vel=2.51 fps Inflow=4.90 cfs 0.843 af
n=0.030 L=20.0' S=0.0750 '/' Capacity=108.67 cfs Outflow=4.90 cfs 0.843 af

Reach DP-4: Southwest Abutter Inflow=0.09 cfs 0.012 af
Outflow=0.09 cfs 0.012 af

Reach DP-5: West Abutter Inflow=3.34 cfs 0.284 af
Outflow=3.34 cfs 0.284 af

Reach DP-6: Northwest Abutter Inflow=1.25 cfs 0.086 af
Outflow=1.25 cfs 0.086 af

Pond DB1: Detention Basin#1 Peak Elev=244.60' Storage=16,532 cf Inflow=9.60 cfs 0.649 af
Outflow=0.94 cfs 0.550 af

Pond DB2: Detention Basin#2 Peak Elev=243.45' Storage=15,231 cf Inflow=9.73 cfs 0.580 af
Outflow=0.96 cfs 0.455 af

Pond R1: Recharger #1 Peak Elev=239.77' Storage=1,142 cf Inflow=1.83 cfs 0.133 af
Discarded=0.11 cfs 0.096 af Primary=1.34 cfs 0.037 af Outflow=1.45 cfs 0.133 af

Pond R2: Recharger #2 Peak Elev=246.98' Storage=2,671 cf Inflow=5.45 cfs 0.408 af
Discarded=0.03 cfs 0.092 af Primary=4.81 cfs 0.315 af Outflow=4.83 cfs 0.407 af

Pond R3: Recharger #3 Peak Elev=250.11' Storage=2,220 cf Inflow=4.60 cfs 0.353 af
Discarded=0.02 cfs 0.075 af Primary=4.16 cfs 0.279 af Outflow=4.19 cfs 0.354 af

Pond R4: Recharger #4 Peak Elev=256.75' Storage=1,501 cf Inflow=1.13 cfs 0.089 af
Discarded=0.03 cfs 0.063 af Primary=0.38 cfs 0.026 af Outflow=0.41 cfs 0.089 af

Pond R5: Recharger #5 Peak Elev=245.26' Storage=3,648 cf Inflow=7.88 cfs 0.584 af
Discarded=0.03 cfs 0.101 af Primary=7.42 cfs 0.471 af Outflow=7.45 cfs 0.572 af

Pond R6: Recharger #6 Peak Elev=251.14' Storage=1,584 cf Inflow=2.43 cfs 0.192 af
Discarded=0.03 cfs 0.084 af Primary=2.33 cfs 0.108 af Outflow=2.36 cfs 0.192 af

Total Runoff Area = 8.217 ac Runoff Volume = 2.712 af Average Runoff Depth = 3.96"
58.28% Pervious = 4.789 ac 41.72% Impervious = 3.428 ac

Summary for Subcatchment P-1A: Front Yards of Existing Dwellings

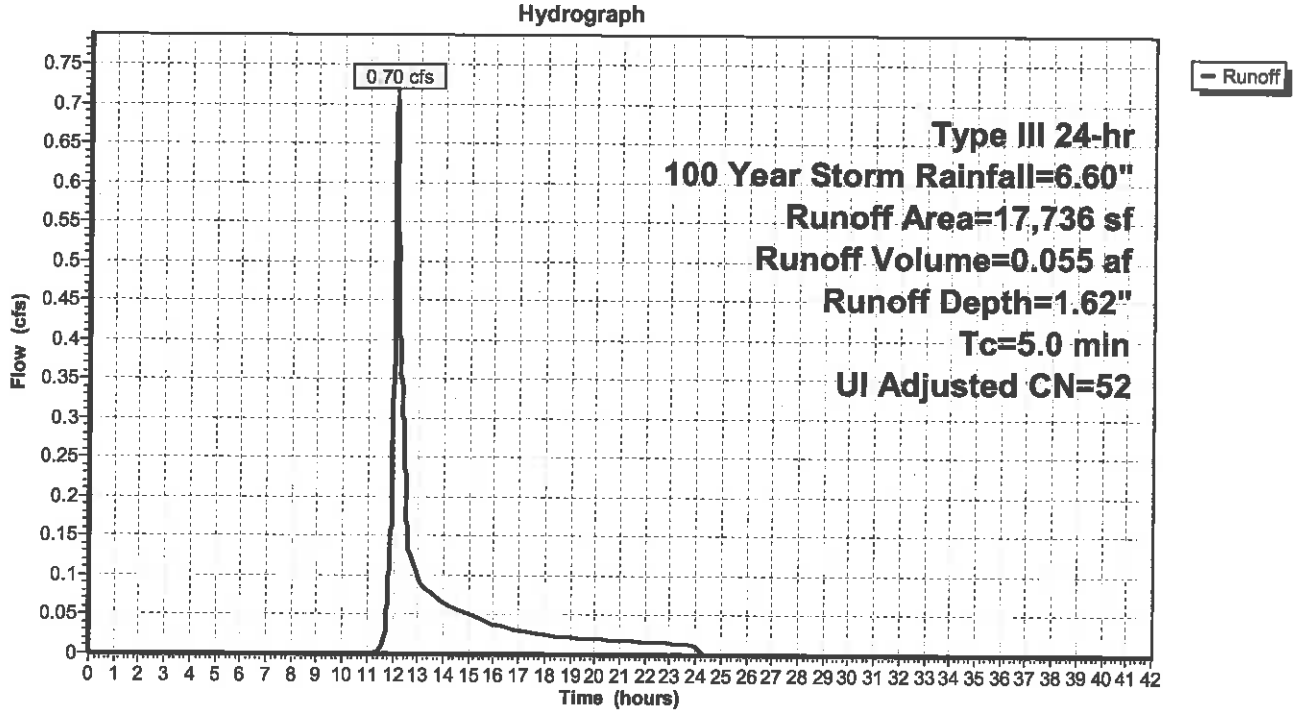
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.055 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Adj	Description
*	10,921	39		>75% Grass cover, Good, HSG A
*	1,426	39		>75% Grass cover, Good, HSG A Off Site
*	462	98		Paved parking, HSG A
*	404	98		Paved parking, HSG A Off Site
*	3,870	80		>75% Grass cover, Good, HSG D
*	280	98		Paved parking, HSG D
*	373	98		Unconnected pavement, HSG D (Ledge)
	17,736	53	52	Weighted Average, UI Adjusted
	16,217			91.44% Pervious Area
	1,519			8.56% Impervious Area
	373			24.56% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-1A: Front Yards of Existing Dwellings



Summary for Subcatchment P-1B: Lower Portion of Driveway

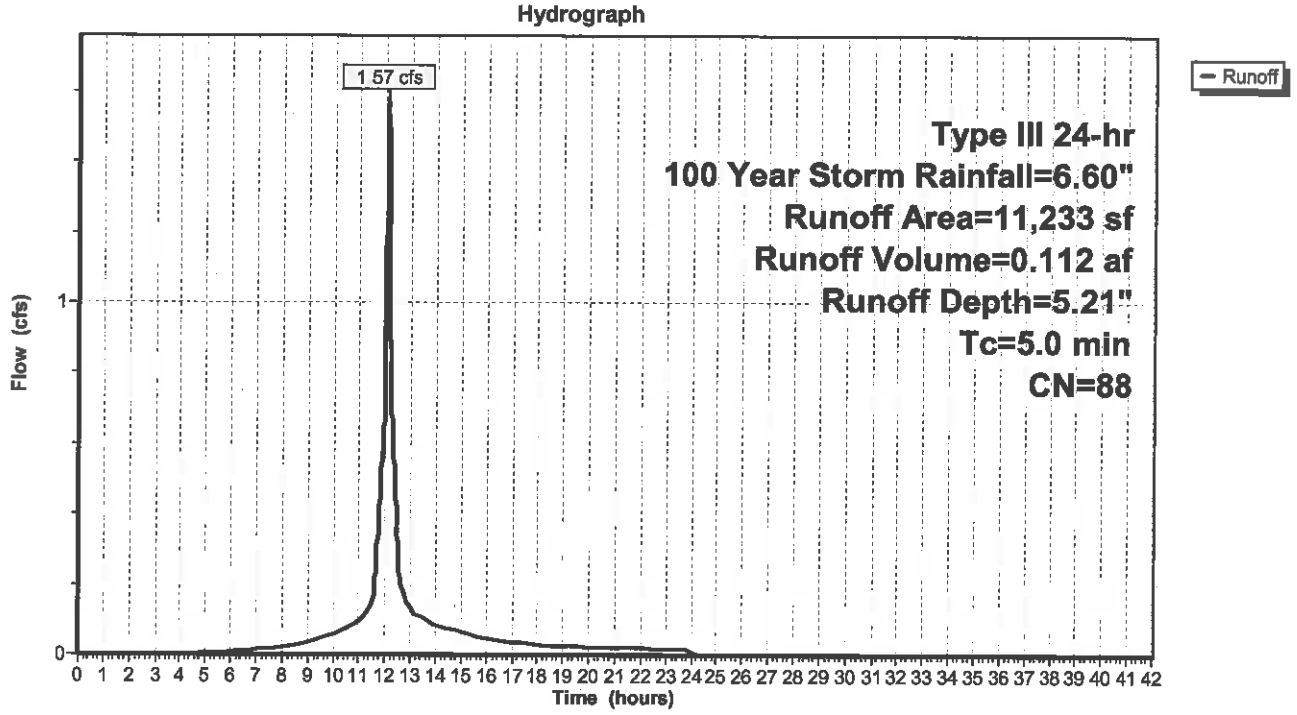
Runoff = 1.57 cfs @ 12.07 hrs, Volume= 0.112 af, Depth= 5.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Description
	2,067	98	Paved parking, HSG D
	4,282	98	Paved parking, HSG A
	802	39	>75% Grass cover, Good, HSG A
	3,689	80	>75% Grass cover, Good, HSG D
	315	96	Gravel surface, HSG D
*	78	98	Unconnected pavement, HSG D (Ledge)
	11,233	88	Weighted Average
	4,806		42.78% Pervious Area
	6,427		57.22% Impervious Area
	78		1.21% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-1B: Lower Portion of Driveway



Summary for Subcatchment P-1C: Area at Dbasin

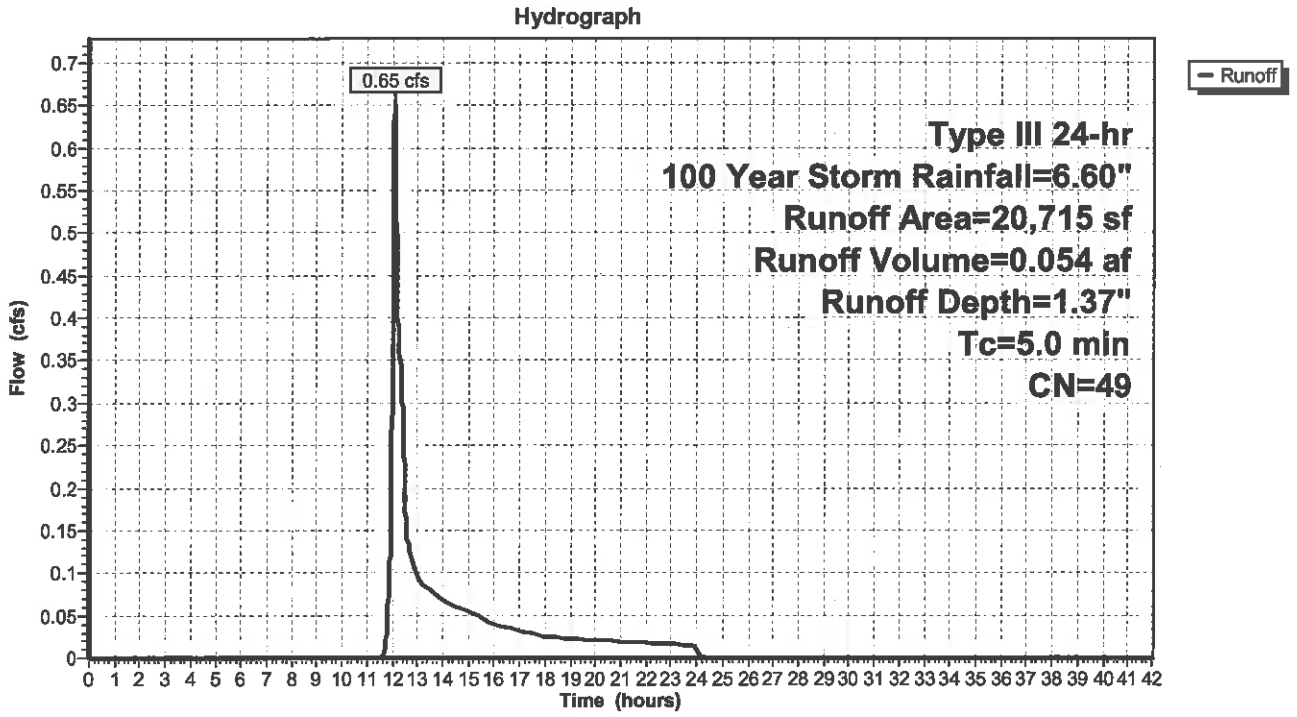
Runoff = 0.65 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Description
*	12,066	39	>75% Grass cover, Good, HSG A
*	1,947	80	>75% Grass cover, Good, HSG D
*	1,535	98	Paved parking, HSG A Off Site
*	479	98	Paved parking, HSG D Off Site
*	4,688	39	>75% Grass cover, Good, HSG A Off Site
	20,715	49	Weighted Average
	18,701		90.28% Pervious Area
	2,014		9.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-1C: Area at Dbasin



Summary for Subcatchment P-1D: Lower Parking Lot

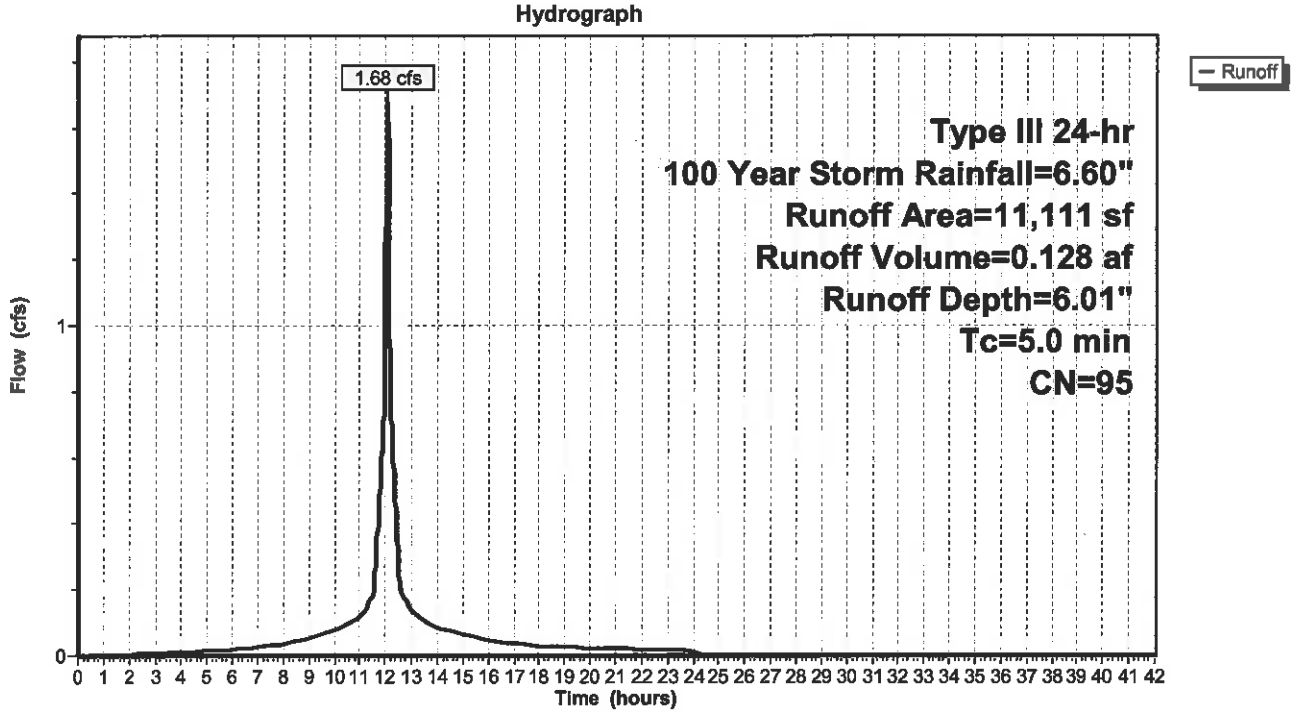
Runoff = 1.68 cfs @ 12.07 hrs, Volume= 0.128 af, Depth= 6.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
958	98	Paved parking, HSG A
8,796	98	Paved parking, HSG D
139	39	>75% Grass cover, Good, HSG A
1,218	80	>75% Grass cover, Good, HSG D
11,111	95	Weighted Average
1,357		12.21% Pervious Area
9,754		87.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-1D: Lower Parking Lot



Summary for Subcatchment P-1E: Middle Front Parking Lot

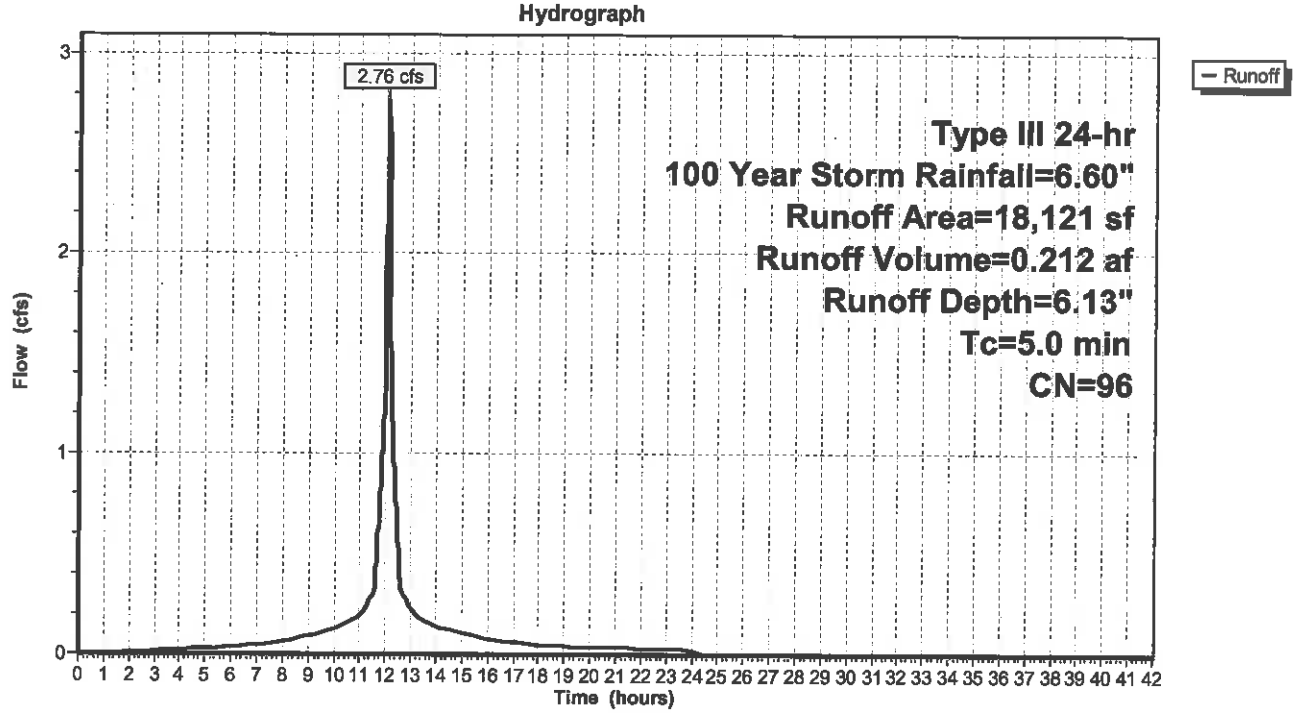
Runoff = 2.76 cfs @ 12.07 hrs, Volume= 0.212 af, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
3,063	98	Paved parking, HSG A
13,438	98	Paved parking, HSG D
334	39	>75% Grass cover, Good, HSG A
1,286	80	>75% Grass cover, Good, HSG D
18,121	96	Weighted Average
1,620		8.94% Pervious Area
16,501		91.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-1E: Middle Front Parking Lot



Summary for Subcatchment P-1F: Eastern Lower Drive

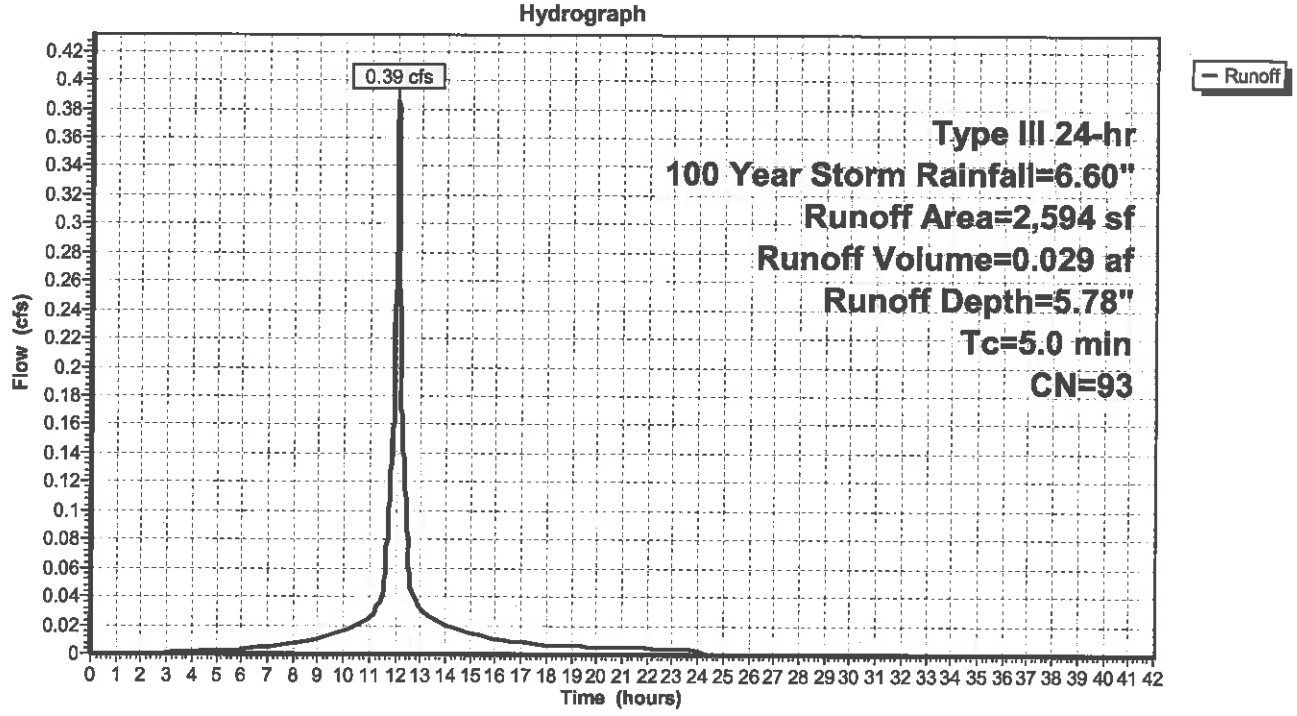
Runoff = 0.39 cfs @ 12.07 hrs, Volume= 0.029 af, Depth= 5.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
798	98	Paved parking, HSG A
1,445	98	Paved parking, HSG D
159	39	>75% Grass cover, Good, HSG A
192	80	>75% Grass cover, Good, HSG D
2,594	93	Weighted Average
351		13.53% Pervious Area
2,243		86.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-1F: Eastern Lower Drive



Summary for Subcatchment P-1G: Upper Front Parking

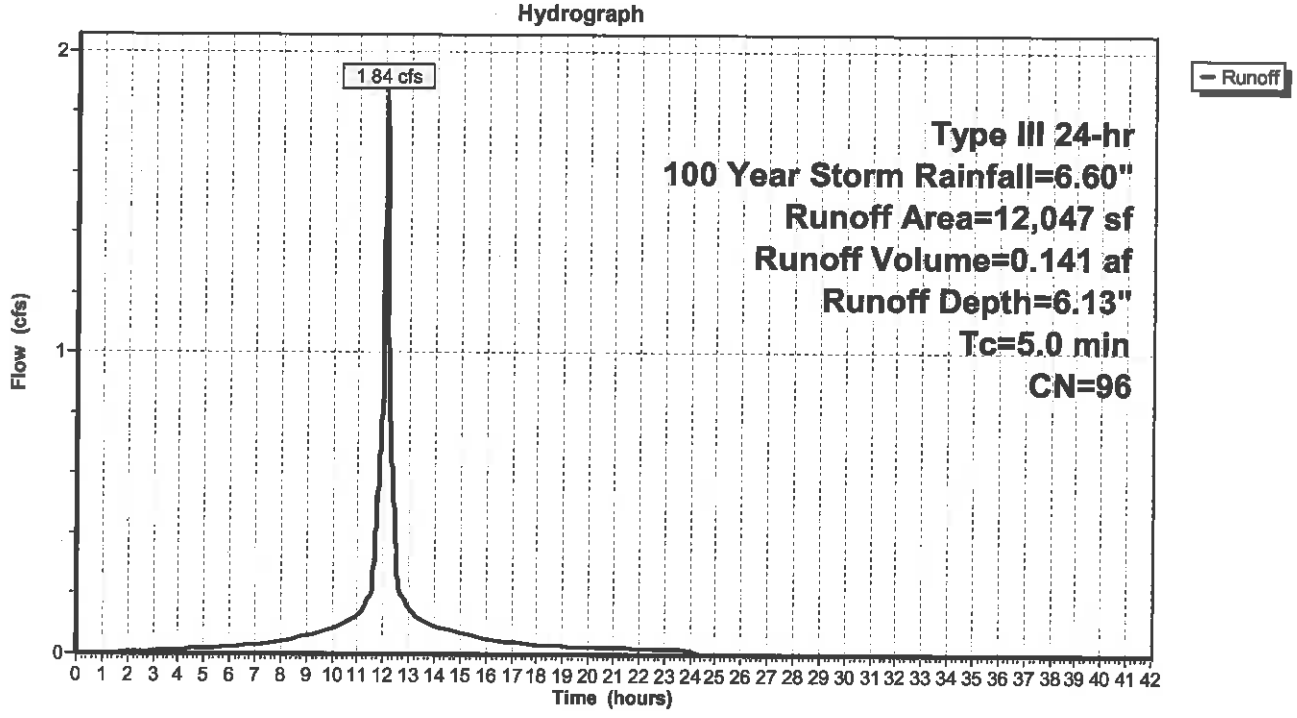
Runoff = 1.84 cfs @ 12.07 hrs, Volume= 0.141 af, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
918	98	Paved parking, HSG A
9,578	98	Paved parking, HSG D
0	39	>75% Grass cover, Good, HSG A
1,551	80	>75% Grass cover, Good, HSG D
12,047	96	Weighted Average
1,551		12.87% Pervious Area
10,496		87.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-1G: Upper Front Parking



Summary for Subcatchment P-1H: Eastern Upper Drive

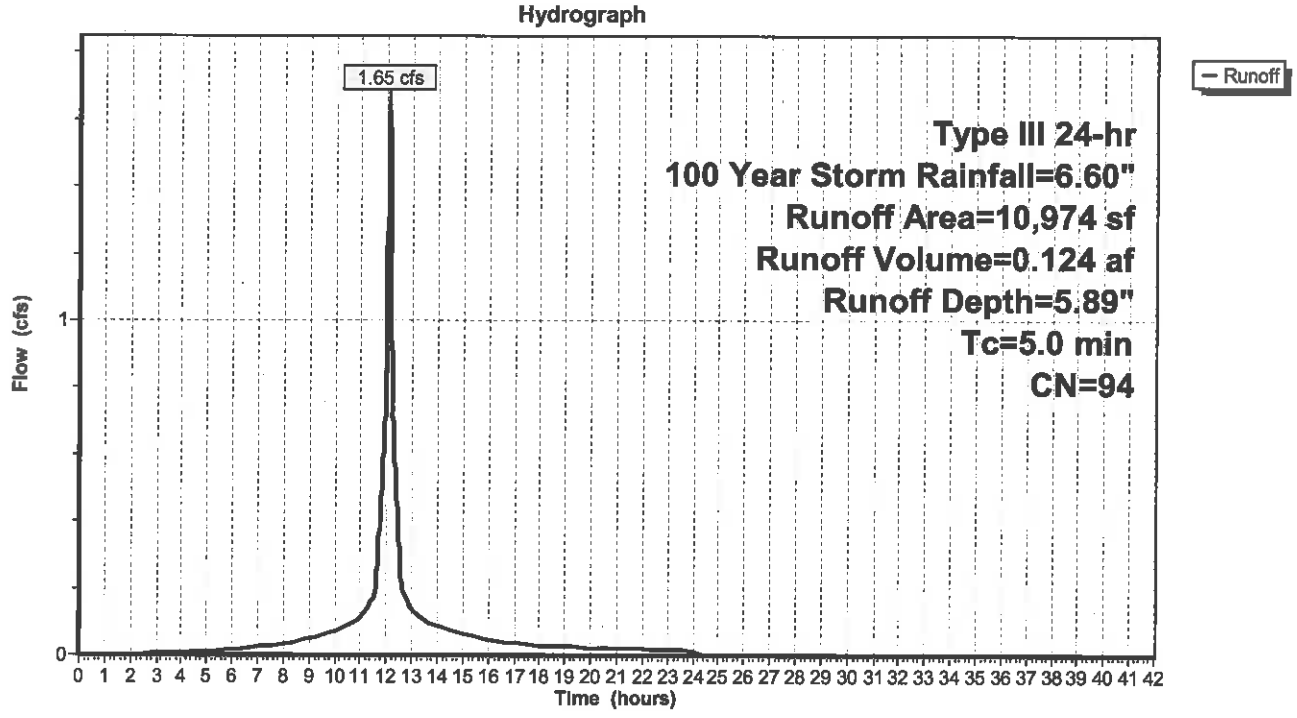
Runoff = 1.65 cfs @ 12.07 hrs, Volume= 0.124 af, Depth= 5.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
562	98	Paved parking, HSG A
8,222	98	Paved parking, HSG D
66	39	>75% Grass cover, Good, HSG A
2,124	80	>75% Grass cover, Good, HSG D
10,974	94	Weighted Average
2,190		19.96% Pervious Area
8,784		80.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-1H: Eastern Upper Drive



Summary for Subcatchment P-1l: West side drive aisle

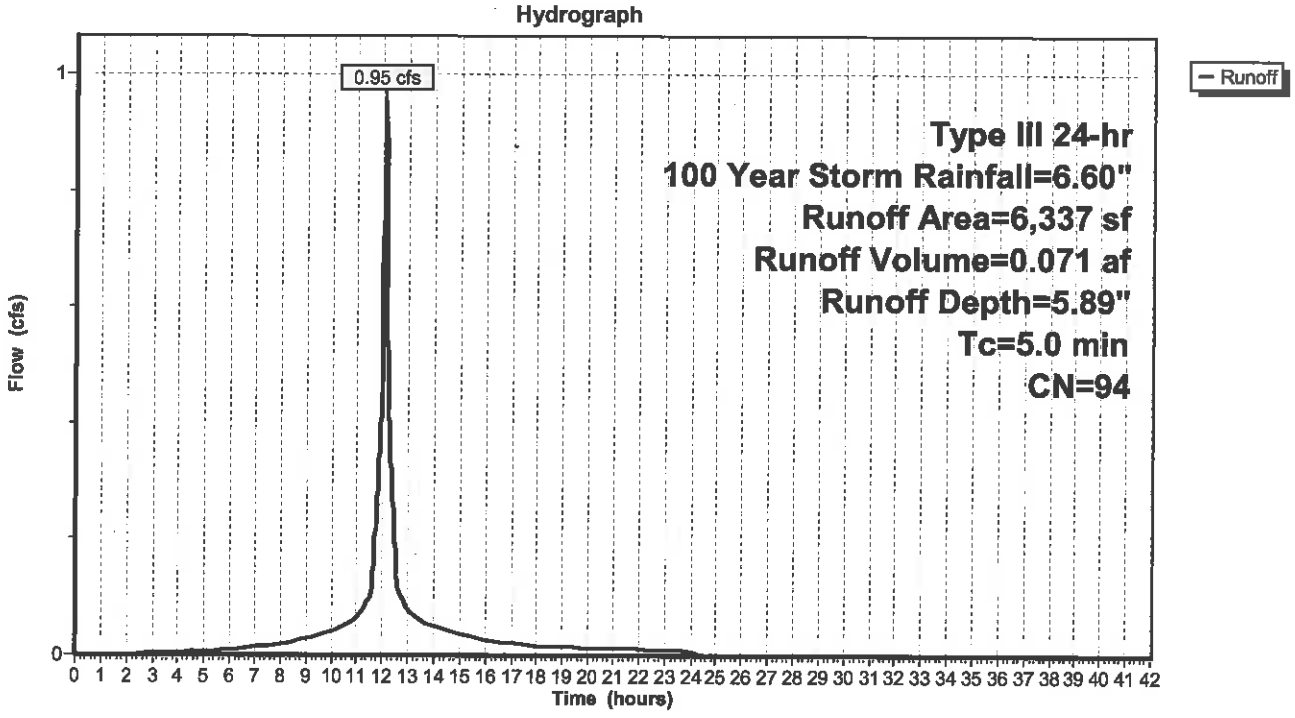
Runoff = 0.95 cfs @ 12.07 hrs, Volume= 0.071 af, Depth= 5.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
771	98	Paved parking, HSG A
4,592	98	Paved parking, HSG D
151	39	>75% Grass cover, Good, HSG A
823	80	>75% Grass cover, Good, HSG D
6,337	94	Weighted Average
974		15.37% Pervious Area
5,363		84.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-1l: West side drive aisle



Summary for Subcatchment P-1J: Loop at Entrance

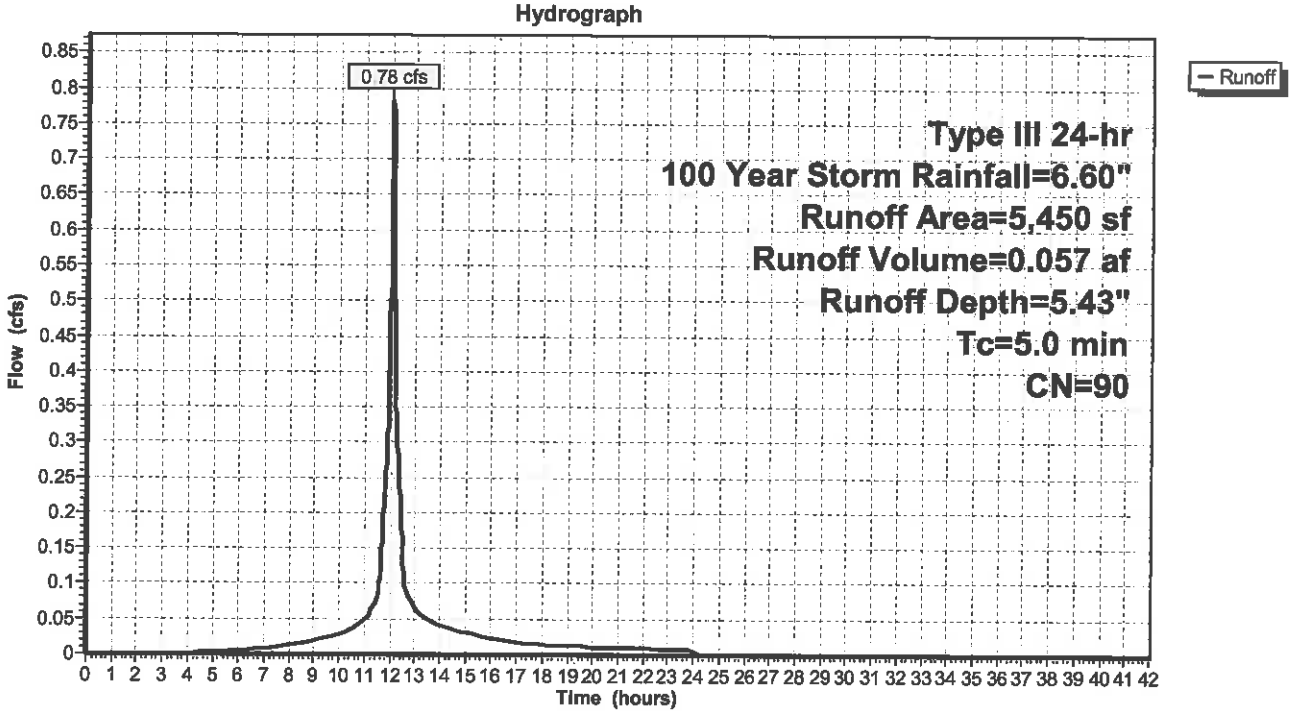
Runoff = 0.78 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
3,084	98	Paved parking, HSG D
2,308	80	>75% Grass cover, Good, HSG D
58	98	Unconnected pavement, HSG D (Ledge)
5,450	90	Weighted Average
2,308		42.35% Pervious Area
3,142		57.65% Impervious Area
58		1.85% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-1J: Loop at Entrance



Summary for Subcatchment P-1K: 82 Edmands

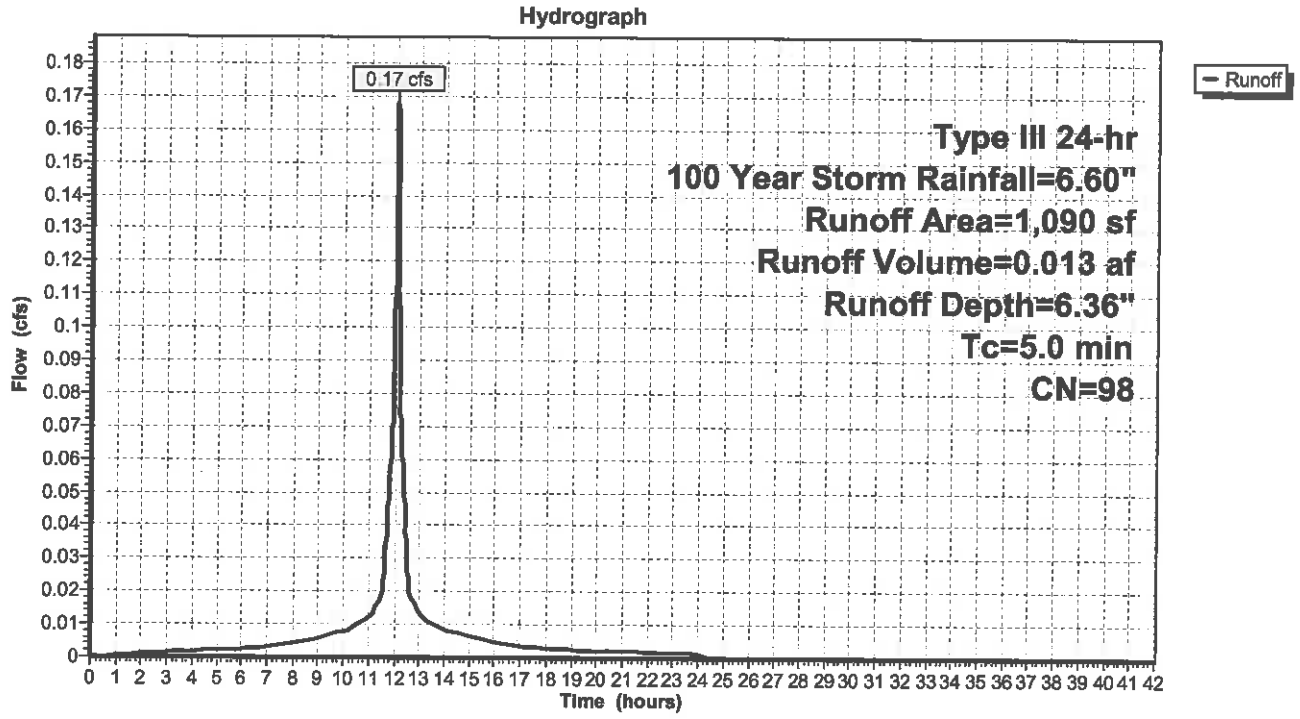
Runoff = 0.17 cfs @ 12.07 hrs, Volume= 0.013 af, Depth= 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
1,090	98	Roofs, HSG D
1,090		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-1K: 82 Edmands



Summary for Subcatchment P-1L: 82A Edmands

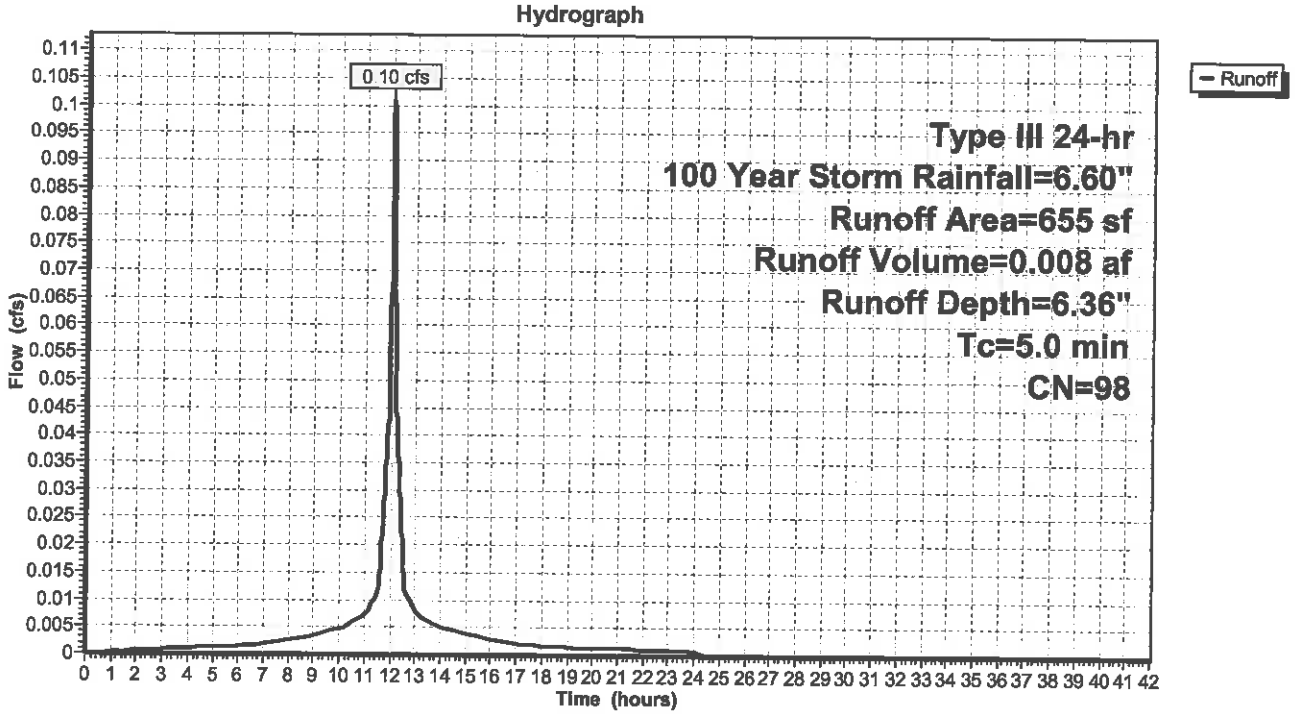
Runoff = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af, Depth= 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
432	98	Roofs, HSG A
223	98	Roofs, HSG D
655	98	Weighted Average
655		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-1L: 82A Edmands



Summary for Subcatchment P-2: to Northeast

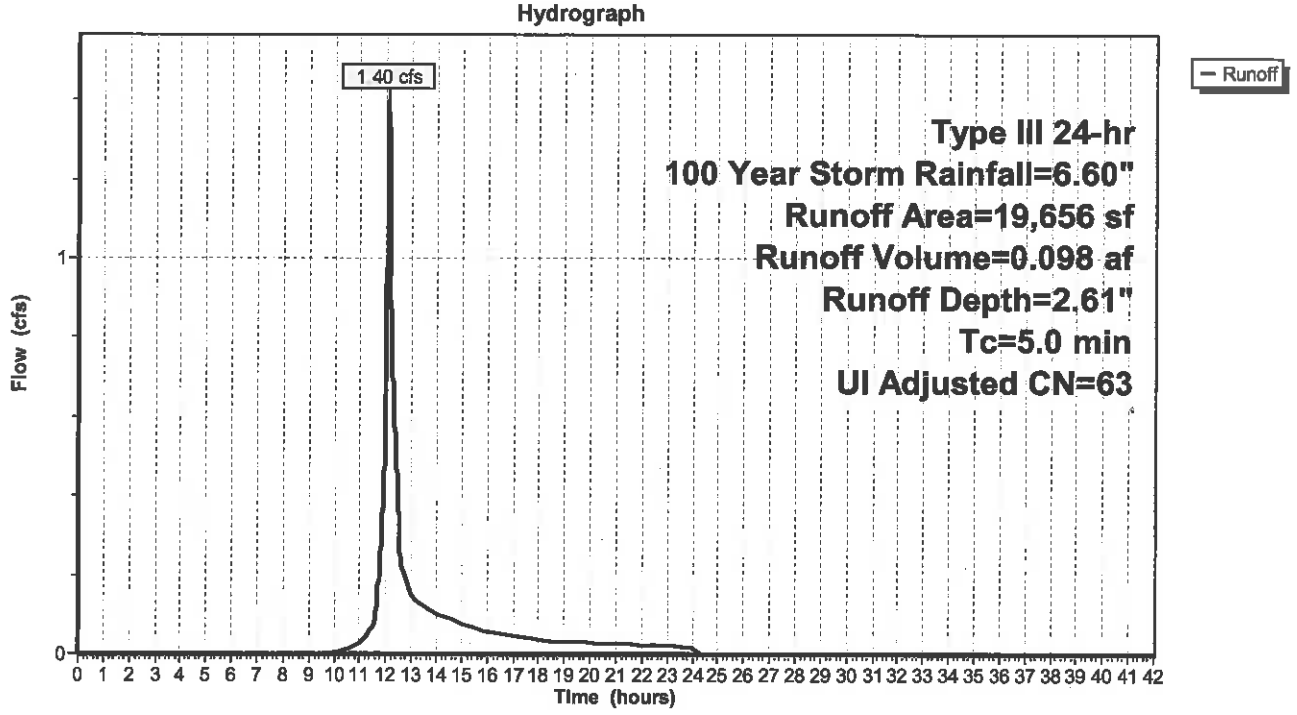
Runoff = 1.40 cfs @ 12.08 hrs, Volume= 0.098 af, Depth= 2.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Adj	Description
	102	98		Paved parking, HSG A
	563	98		Paved parking, HSG D
	7,621	80		>75% Grass cover, Good, HSG D
	9,089	39		>75% Grass cover, Good, HSG A
	800	96		Gravel surface, HSG A
	612	96		Gravel surface, HSG D
*	869	98		Unconnected pavement, HSG D (Ledge)
	19,656	64	63	Weighted Average, UI Adjusted
	18,122			92.20% Pervious Area
	1,534			7.80% Impervious Area
	869			56.65% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-2: to Northeast



Summary for Subcatchment P-3A: Roof

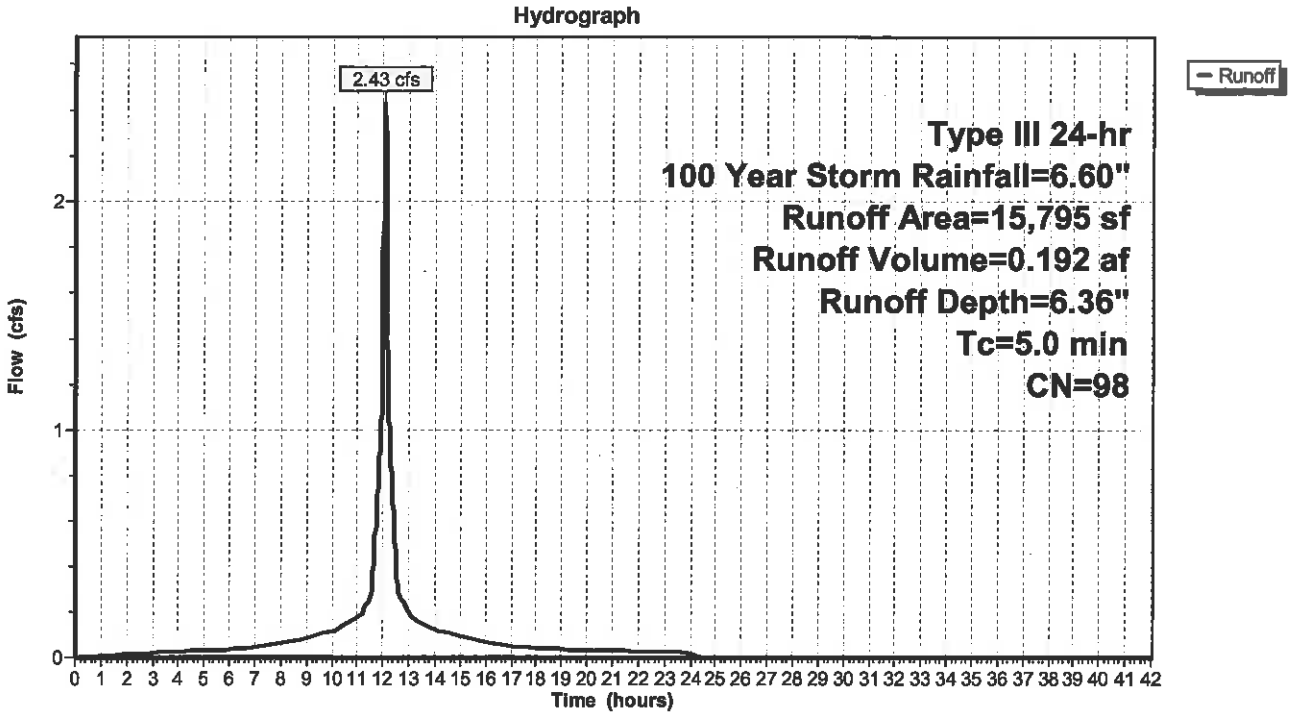
Runoff = 2.43 cfs @ 12.07 hrs, Volume= 0.192 af, Depth= 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
15,795	98	Roofs, HSG D
15,795		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-3A: Roof



Summary for Subcatchment P-3B: Roof

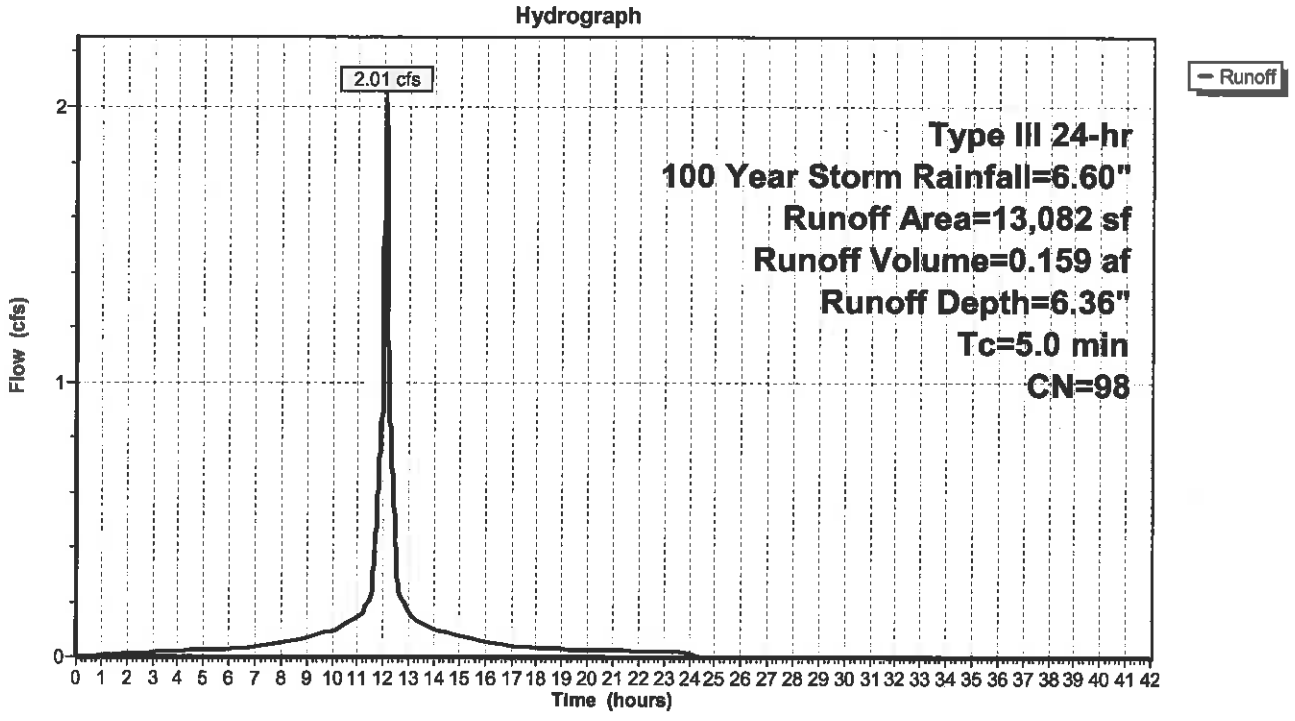
Runoff = 2.01 cfs @ 12.07 hrs, Volume= 0.159 af, Depth= 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
13,082	98	Roofs, HSG D
13,082		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-3B: Roof



Summary for Subcatchment P-3C: Driveway

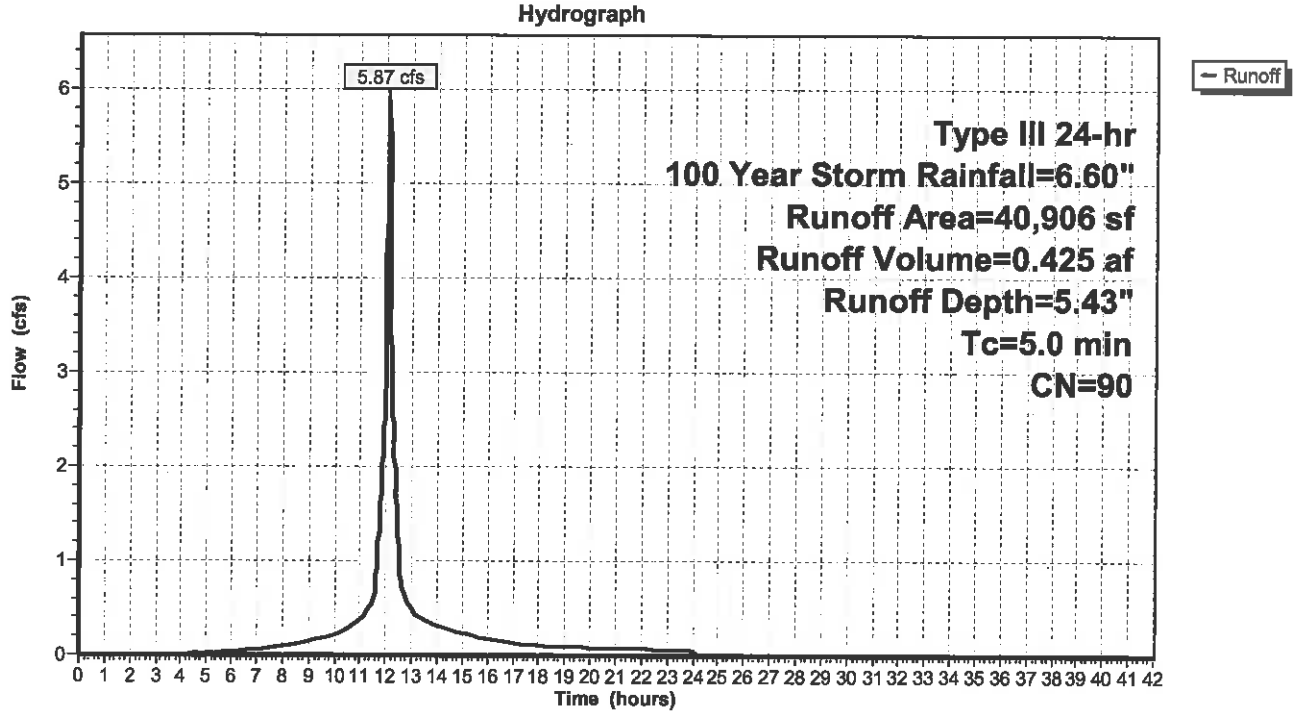
Runoff = 5.87 cfs @ 12.07 hrs, Volume= 0.425 af, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Description
	14,344	98	Paved parking, HSG A
	12,614	98	Paved parking, HSG D
	3,429	39	>75% Grass cover, Good, HSG A
	6,902	80	>75% Grass cover, Good, HSG D
*	3,617	98	Unconnected pavement, HSG D (Ledge)
	40,906	90	Weighted Average
	10,331		25.26% Pervious Area
	30,575		74.74% Impervious Area
	3,617		11.83% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-3C: Driveway



Summary for Subcatchment P-3D: to Southeast

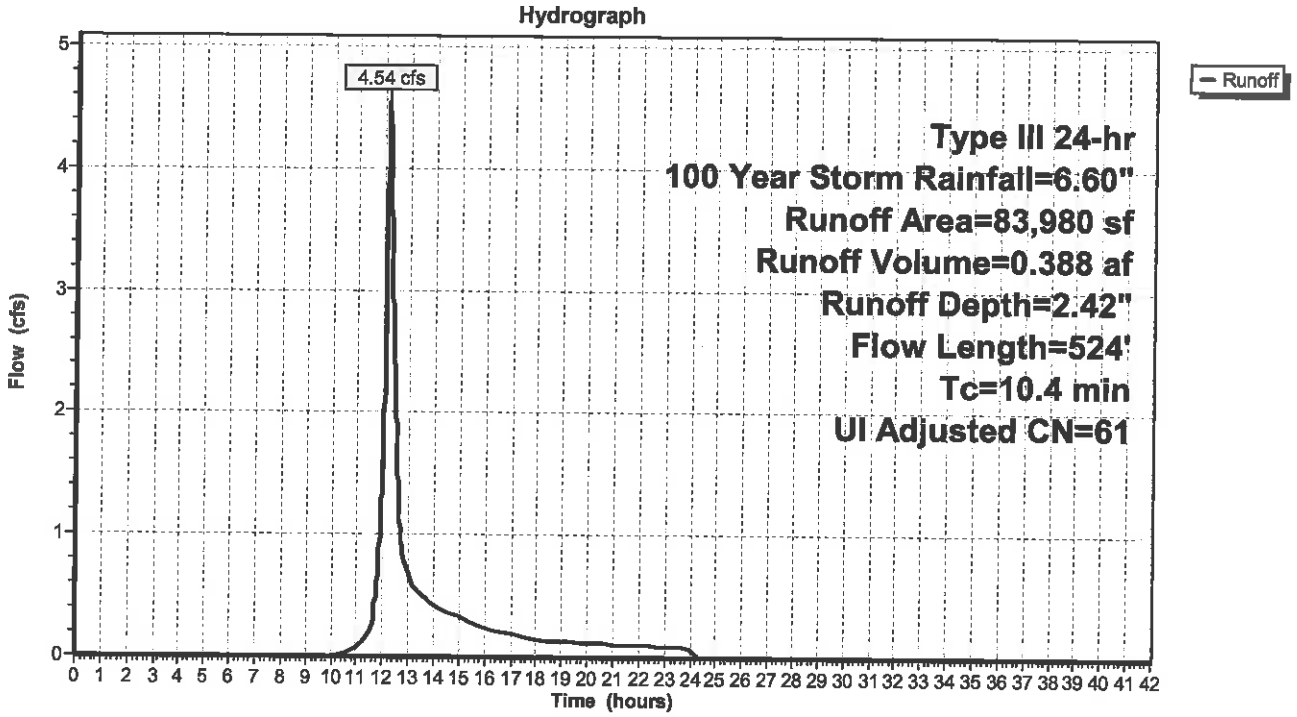
Runoff = 4.54 cfs @ 12.15 hrs, Volume= 0.388 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Adj	Description
	458	98		Paved parking, HSG A
	163	98		Paved parking, HSG D
*	3,852	98		Unconnected pavement, HSG D OFF-SITE (Ledge)
	23,093	39		>75% Grass cover, Good, HSG A
	10,364	30		Woods, Good, HSG A
	6,404	80		>75% Grass cover, Good, HSG D
*	34,731	77		Woods, Good, HSG D OFF-SITE
*	4,915	98		Unconnected pavement, HSG D (Ledge)
	83,980	63	61	Weighted Average, UI Adjusted
	74,592			88.82% Pervious Area
	9,388			11.18% Impervious Area
	8,767			93.39% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
6.1	474	0.0338	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.4	524	Total			

Subcatchment P-3D: to Southeast



Summary for Subcatchment P-4: to Southwest

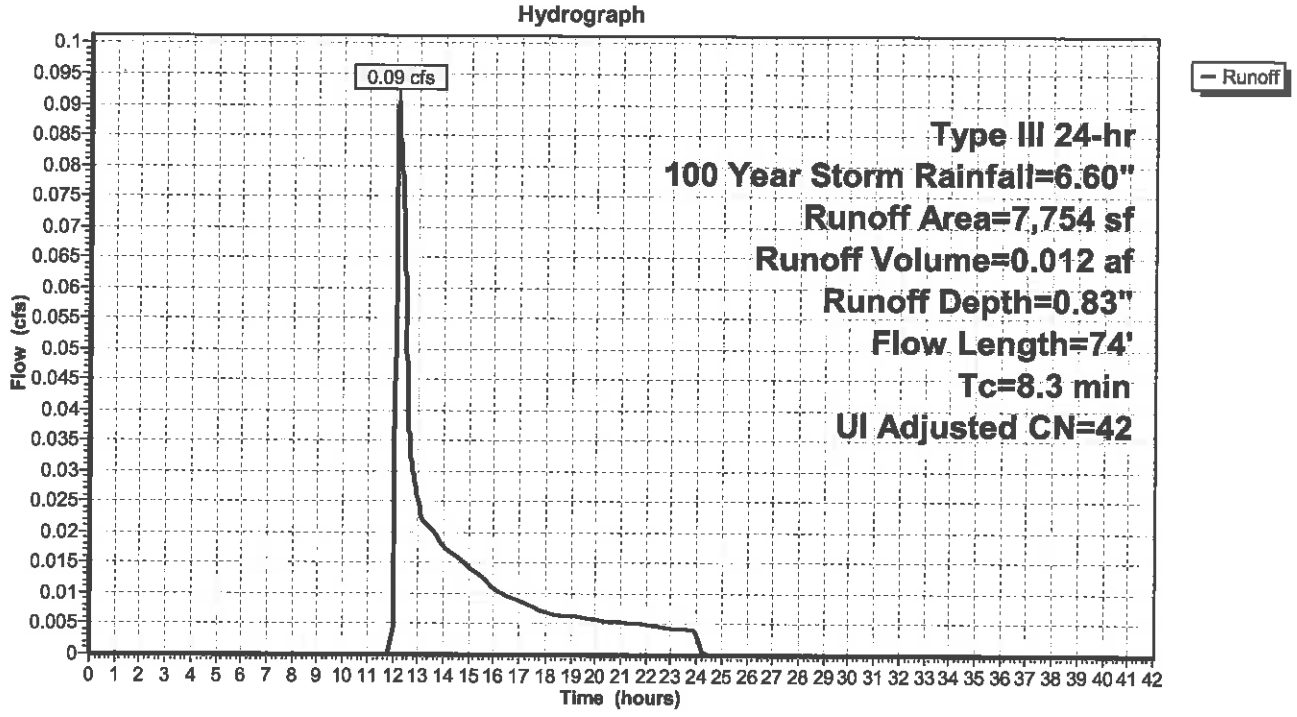
Runoff = 0.09 cfs @ 12.17 hrs, Volume= 0.012 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Adj	Description
*	636	98		Unconnected pavement, HSG D (Ledge)
	1,495	77		Woods, Good, HSG D
	5,623	30		Woods, Good, HSG A
	7,754	45	42	Weighted Average, UI Adjusted
	7,118			91.80% Pervious Area
	636			8.20% Impervious Area
	636			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	24	0.0420	1.02		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	74	Total			

Subcatchment P-4: to Southwest



Summary for Subcatchment P-5A: to West

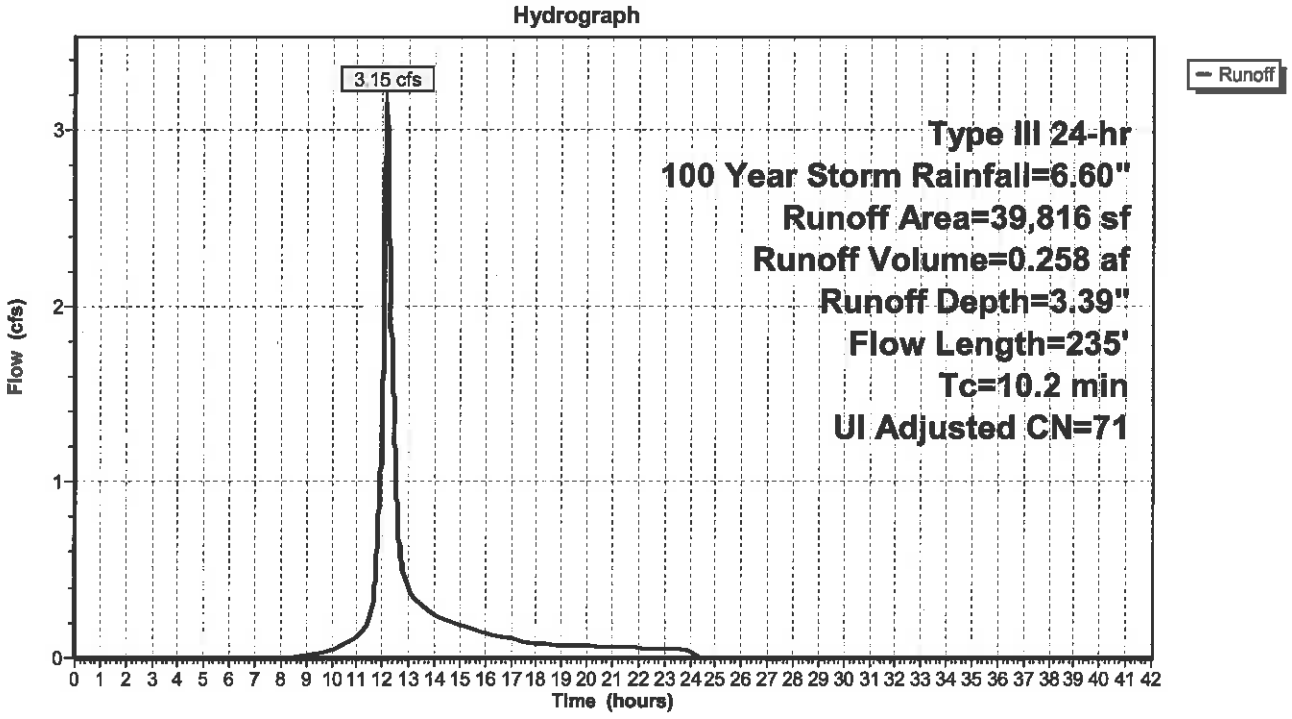
Runoff = 3.15 cfs @ 12.14 hrs, Volume= 0.258 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Adj	Description
*	2,511	98		Unconnected pavement, HSG D (Ledge)
	14,168	80		>75% Grass cover, Good, HSG D
	6,179	39		>75% Grass cover, Good, HSG A
	15,802	77		Woods, Good, HSG D
	1,156	30		Woods, Good, HSG A
	39,816	72	71	Weighted Average, UI Adjusted
	37,305			93.69% Pervious Area
	2,511			6.31% Impervious Area
	2,511			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
3.8	100	0.0040	0.44		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	40	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	45	0.0889	1.49		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.2	235	Total			

Subcatchment P-5A: to West



Summary for Subcatchment P-5B: Roof

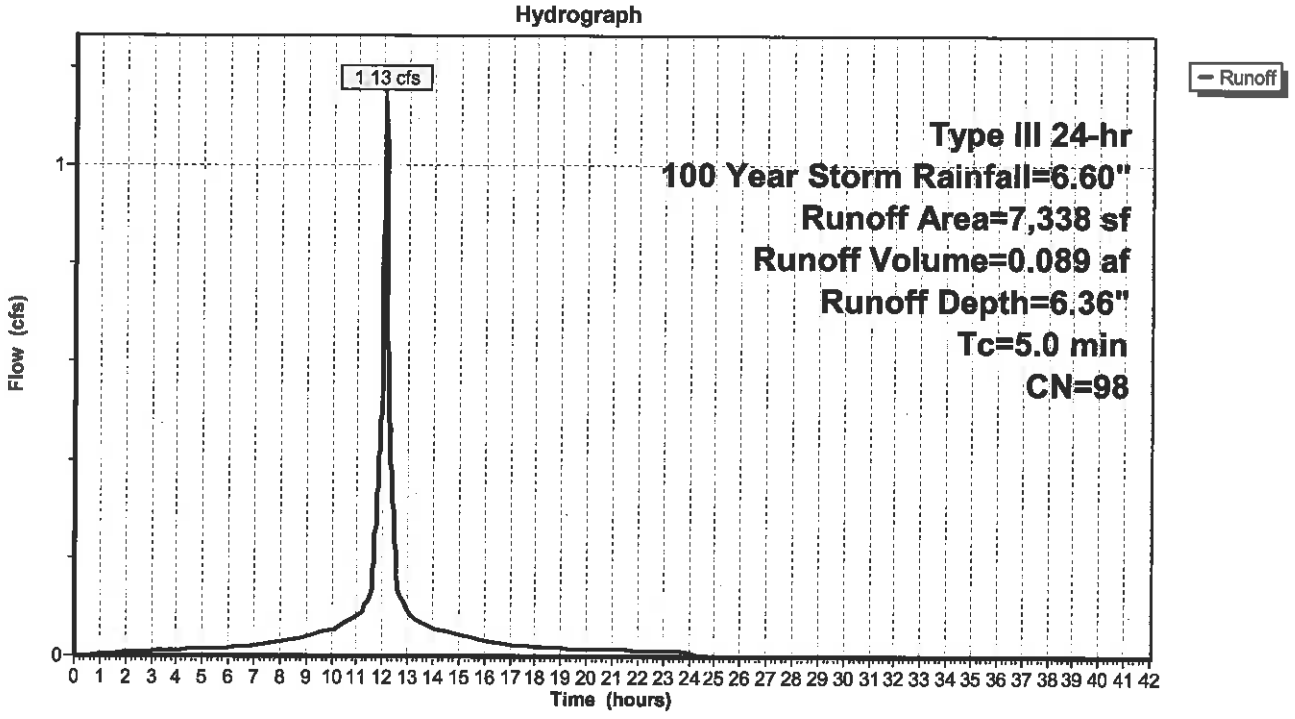
Runoff = 1.13 cfs @ 12.07 hrs, Volume= 0.089 af, Depth= 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

Area (sf)	CN	Description
7,338	98	Roofs, HSG D
7,338		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-5B: Roof



Summary for Subcatchment P-6: to Northwest

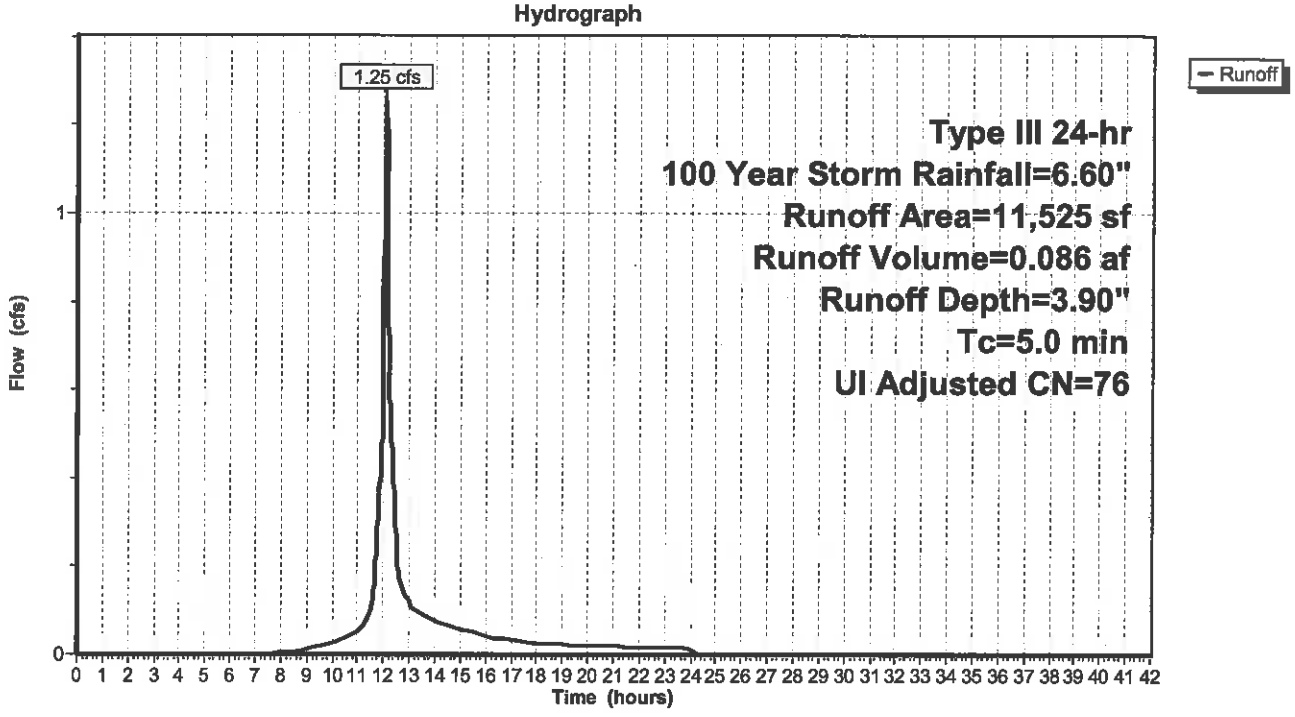
Runoff = 1.25 cfs @ 12.07 hrs, Volume= 0.086 af, Depth= 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=6.60"

	Area (sf)	CN	Adj	Description
*	461	98		Unconnected pavement, HSG D (Ledge)
	7,215	80		>75% Grass cover, Good, HSG D
	899	39		>75% Grass cover, Good, HSG A
	2,950	77		Woods, Good, HSG D
	11,525	77	76	Weighted Average, UI Adjusted
	11,064			96.00% Pervious Area
	461			4.00% Impervious Area
	461			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment P-6: to Northwest



Summary for Reach DP-1: Edmands Road

Inflow Area = 2.710 ac, 57.59% Impervious, Inflow Depth > 2.84" for 100 Year Storm event
Inflow = 2.50 cfs @ 12.13 hrs, Volume= 0.641 af
Outflow = 2.50 cfs @ 12.13 hrs, Volume= 0.641 af, Atten= 0%, Lag= 0.2 min

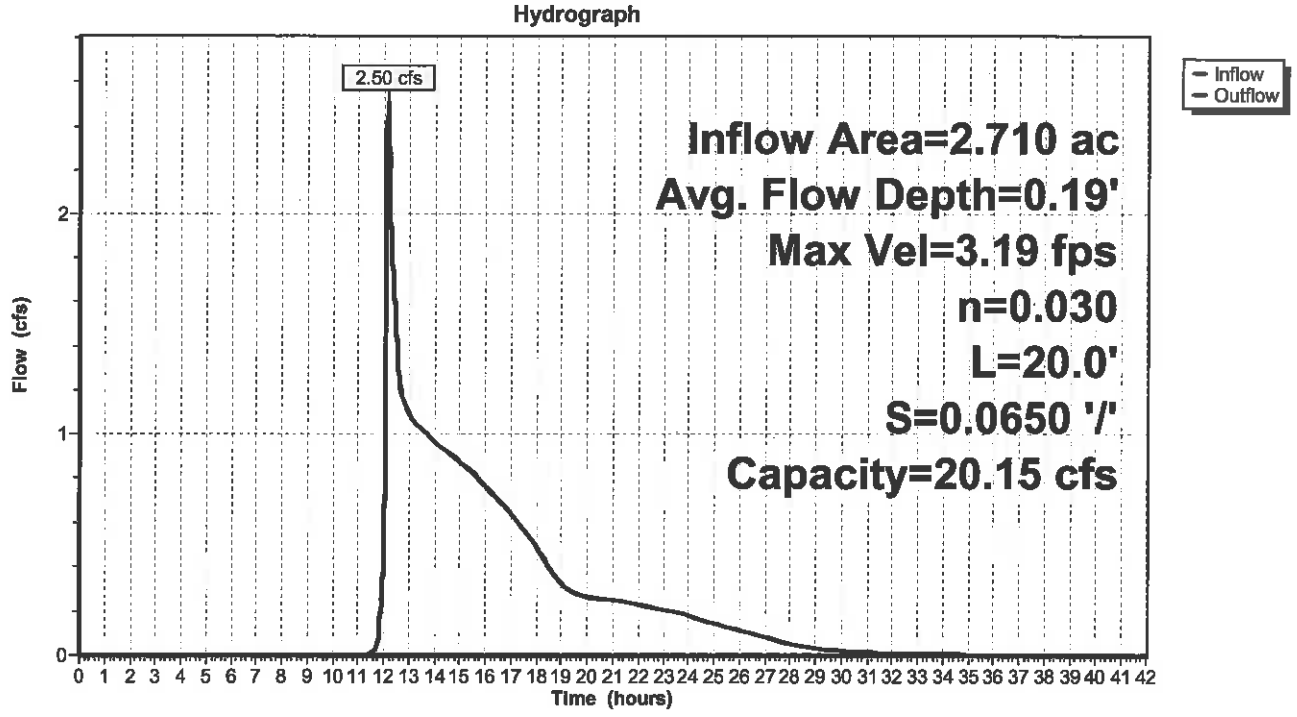
Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.19 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 0.3 min

Peak Storage= 16 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 20.15 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.030
Length= 20.0' Slope= 0.0650 '/'
Inlet Invert= 236.80', Outlet Invert= 235.50'

‡

Reach DP-1: Edmands Road

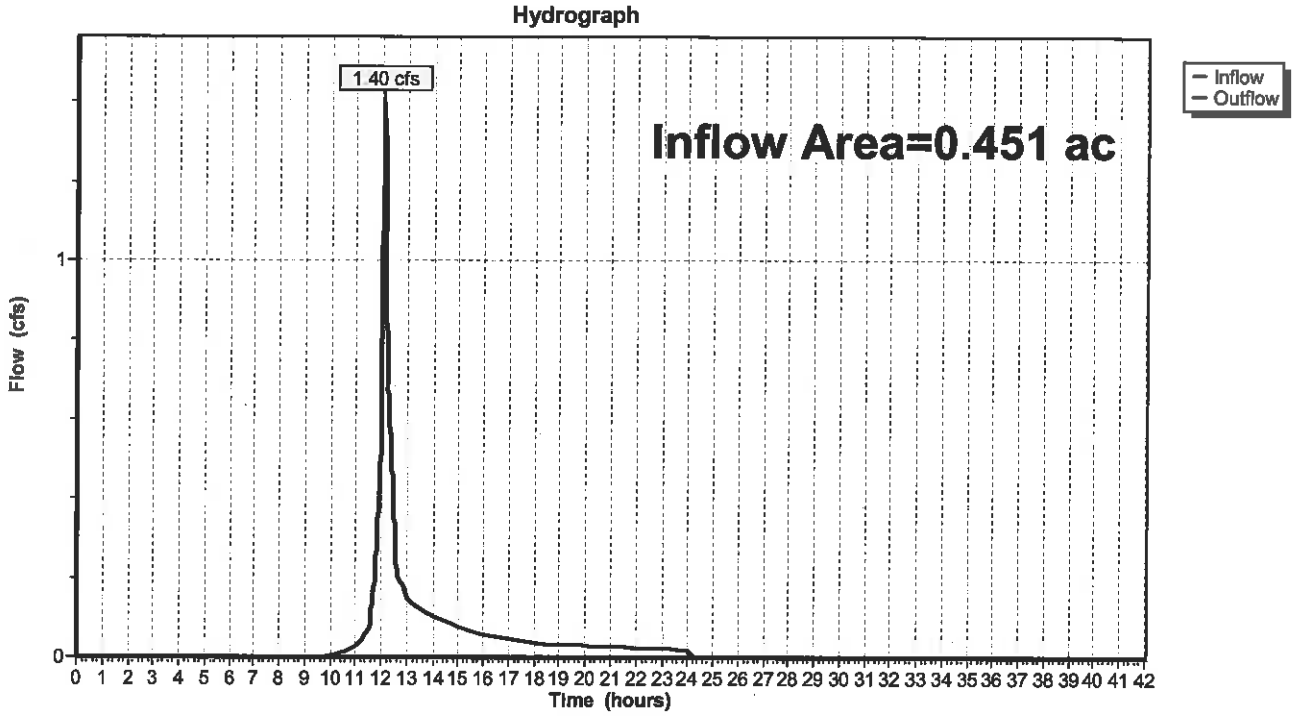


Summary for Reach DP-2: Northeast Abutter

Inflow Area = 0.451 ac, 7.80% Impervious, Inflow Depth = 2.61" for 100 Year Storm event
Inflow = 1.40 cfs @ 12.08 hrs, Volume= 0.098 af
Outflow = 1.40 cfs @ 12.08 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs

Reach DP-2: Northeast Abutter



Summary for Reach DP-3: Southeast Abutter

Inflow Area = 3.530 ac, 44.77% Impervious, Inflow Depth > 2.87" for 100 Year Storm event
Inflow = 4.90 cfs @ 12.16 hrs, Volume= 0.843 af
Outflow = 4.90 cfs @ 12.16 hrs, Volume= 0.843 af, Atten= 0%, Lag= 0.3 min

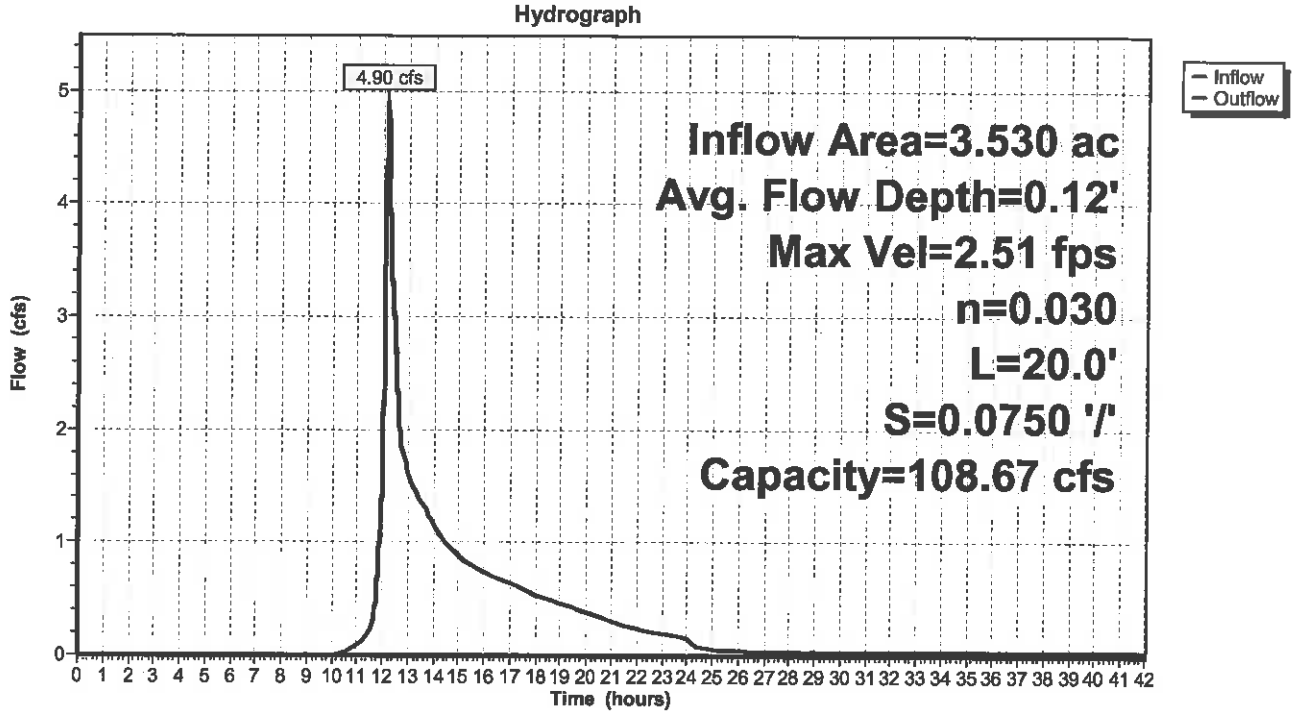
Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.51 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 0.4 min

Peak Storage= 39 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 0.50' Flow Area= 16.7 sf, Capacity= 108.67 cfs

50.00' x 0.50' deep Parabolic Channel, n= 0.030
Length= 20.0' Slope= 0.0750 '/'
Inlet Invert= 239.00', Outlet Invert= 237.50'

‡

Reach DP-3: Southeast Abutter

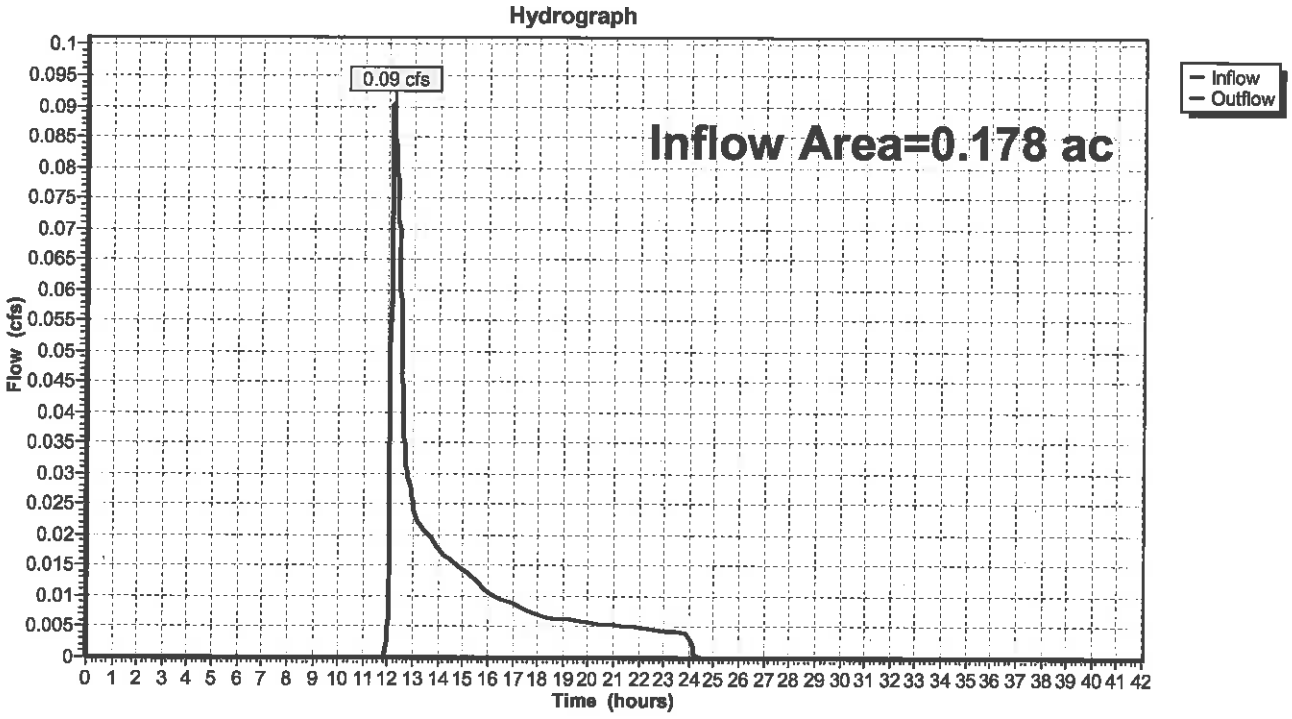


Summary for Reach DP-4: Southwest Abutter

Inflow Area = 0.178 ac, 8.20% Impervious, Inflow Depth = 0.83" for 100 Year Storm event
Inflow = 0.09 cfs @ 12.17 hrs, Volume= 0.012 af
Outflow = 0.09 cfs @ 12.17 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs

Reach DP-4: Southwest Abutter

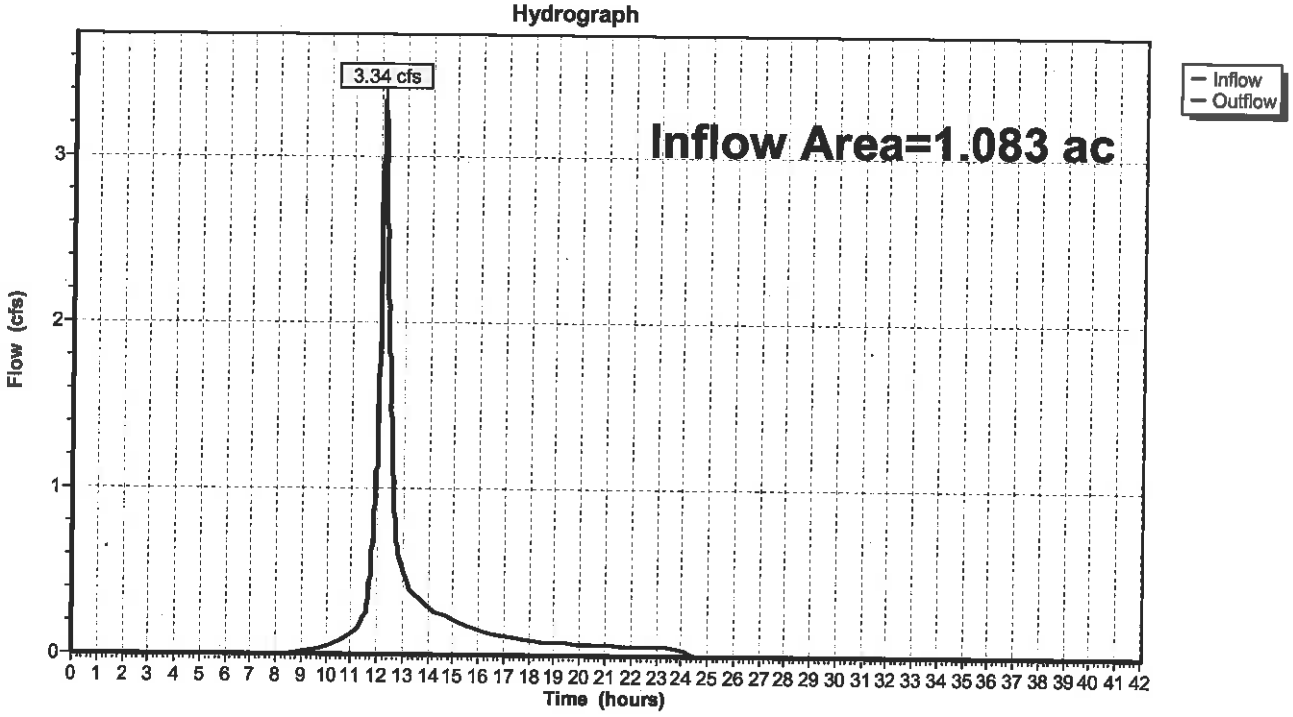


Summary for Reach DP-5: West Abutter

Inflow Area = 1.083 ac, 20.89% Impervious, Inflow Depth = 3.15" for 100 Year Storm event
Inflow = 3.34 cfs @ 12.16 hrs, Volume= 0.284 af
Outflow = 3.34 cfs @ 12.16 hrs, Volume= 0.284 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs

Reach DP-5: West Abutter

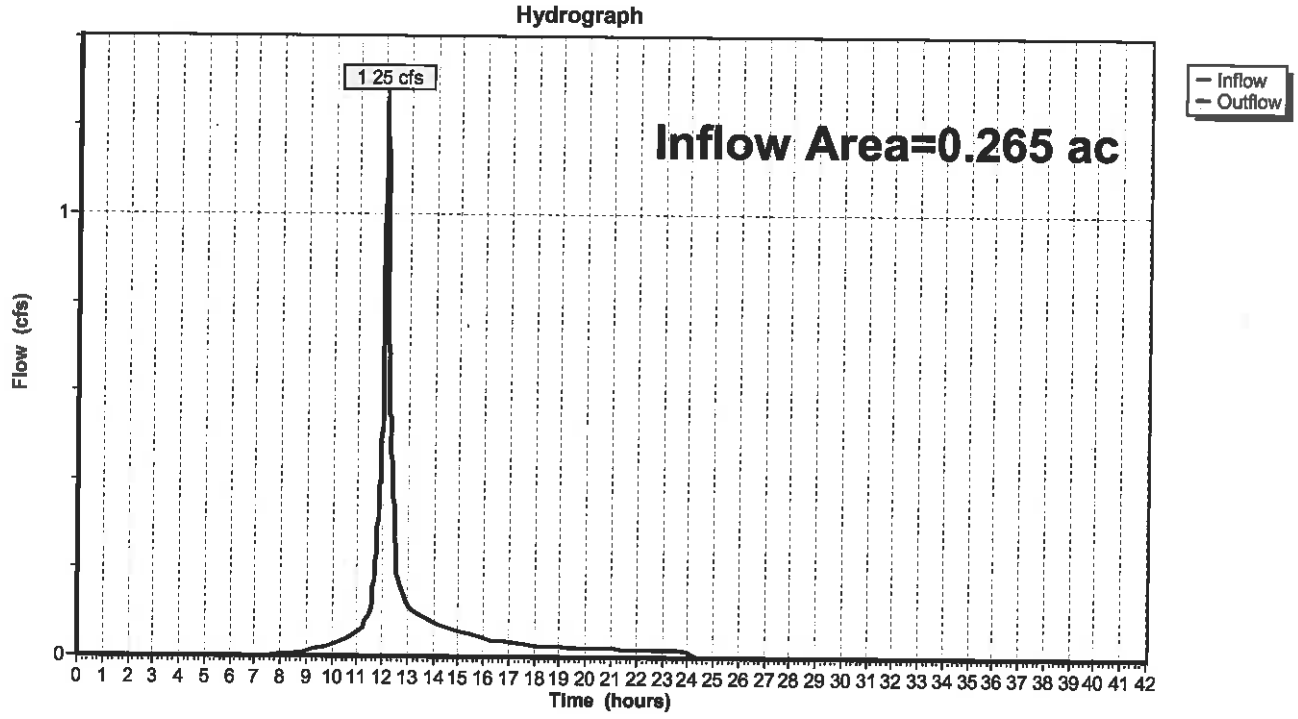


Summary for Reach DP-6: Northwest Abutter

Inflow Area = 0.265 ac, 4.00% Impervious, Inflow Depth = 3.90" for 100 Year Storm event
Inflow = 1.25 cfs @ 12.07 hrs, Volume= 0.086 af
Outflow = 1.25 cfs @ 12.07 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs

Reach DP-6: Northwest Abutter



Summary for Pond DB1: Detention Basin#1

Inflow Area = 2.005 ac, 66.74% Impervious, Inflow Depth = 3.88" for 100 Year Storm event
Inflow = 9.60 cfs @ 12.11 hrs, Volume= 0.649 af
Outflow = 0.94 cfs @ 12.97 hrs, Volume= 0.550 af, Atten= 90%, Lag= 52.0 min
Primary = 0.94 cfs @ 12.97 hrs, Volume= 0.550 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Peak Elev= 244.60' @ 12.97 hrs Surf.Area= 5,281 sf Storage= 16,532 cf

Plug-Flow detention time= 283.4 min calculated for 0.549 af (85% of inflow)
Center-of-Mass det. time= 229.4 min (1,026.9 - 797.6)

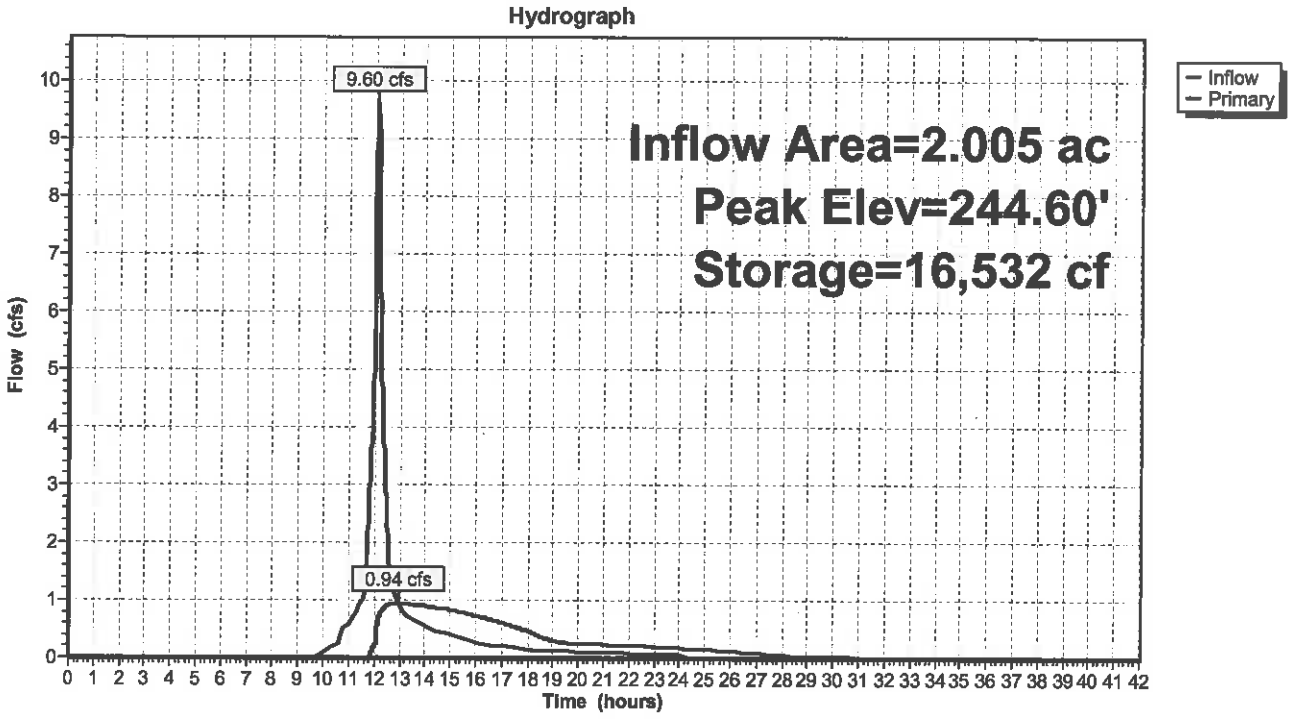
Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	18,727 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	36	24.0	0	0	36
239.50	571	91.0	125	125	650
240.00	1,404	151.0	478	603	1,807
241.00	2,600	212.0	1,972	2,575	3,578
242.00	3,274	233.0	2,931	5,506	4,354
243.00	4,002	252.0	3,632	9,137	5,127
244.00	4,786	271.0	4,388	13,526	5,960
244.50	5,199	280.0	2,496	16,021	6,378
245.00	5,626	290.0	2,706	18,727	6,853

Device	Routing	Invert	Outlet Devices
#1	Primary	240.00'	**10.0" Round Culvert** L= 169.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 240.00' / 239.00' S= 0.0059 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	241.60'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	242.80'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	244.60'	**10.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.94 cfs @ 12.97 hrs HW=244.60' (Free Discharge)
- **1=Culvert** (Passes 0.94 cfs of 3.32 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.40 cfs @ 8.16 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.54 cfs @ 6.15 fps)
- **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond DB1: Detention Basin#1



Summary for Pond DB2: Detention Basin#2

Inflow Area = 1.602 ac, 85.20% Impervious, Inflow Depth = 4.34" for 100 Year Storm event
Inflow = 9.73 cfs @ 12.10 hrs, Volume= 0.580 af
Outflow = 0.96 cfs @ 12.85 hrs, Volume= 0.455 af, Atten= 90%, Lag= 45.5 min
Primary = 0.96 cfs @ 12.85 hrs, Volume= 0.455 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs
Peak Elev= 243.45' @ 12.85 hrs Surf.Area= 4,692 sf Storage= 15,231 cf

Plug-Flow detention time= 341.0 min calculated for 0.455 af (78% of inflow)
Center-of-Mass det. time= 280.3 min (1,073.9 - 793.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	239.80'	0 cf	**38.75'W x 121.08'L x 5.50'H Field A** 25,806 cf Overall - 25,806 cf Embedded = 0 cf x 40.0% Voids
#2A	239.80'	20,851 cf	**StormTrap SingleTrap 5-0** x 21 Inside #1 Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf 3 Rows of 7 Chambers 25.44' x 107.77' Core + 6.66' Border = 38.75' x 121.08' System
		20,851 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	239.40'	**10.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 239.40' / 239.20' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	239.80'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	241.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	243.00'	**5.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#5	Primary	243.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.96 cfs @ 12.85 hrs HW=243.45' (Free Discharge)
- **1=Culvert** (Passes 0.96 cfs of 4.60 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.15 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.56 cfs @ 6.43 fps)
  - **4=Orifice/Grate** (Orifice Controls 0.35 cfs @ 2.53 fps)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond DB2: Detention Basin#2 - Chamber Wizard Field A

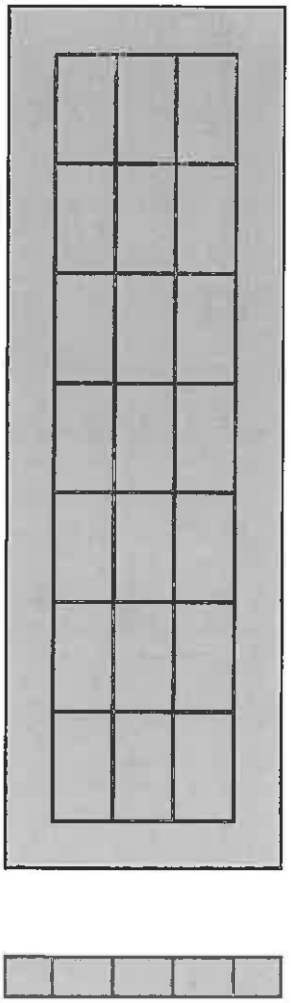
Chamber Model = StormTrap SingleTrap 5-0 (StormTrap SingleTrap® 5'-0" tall Type II + IV)
Inside= 101.7"W x 60.0"H => 38.33 sf x 15.40'L = 590.2 cf
Outside= 101.7"W x 66.0"H => 46.64 sf x 15.40'L = 718.0 cf

7 Chambers/Row x 15.40' Long = 107.77' Row Length +79.9" Border x 2 = 121.08' Base Length
3 Rows x 101.7" Wide + 79.9" Side Border x 2 = 38.75' Base Width
66.0" Chamber Height = 5.50' Field Height

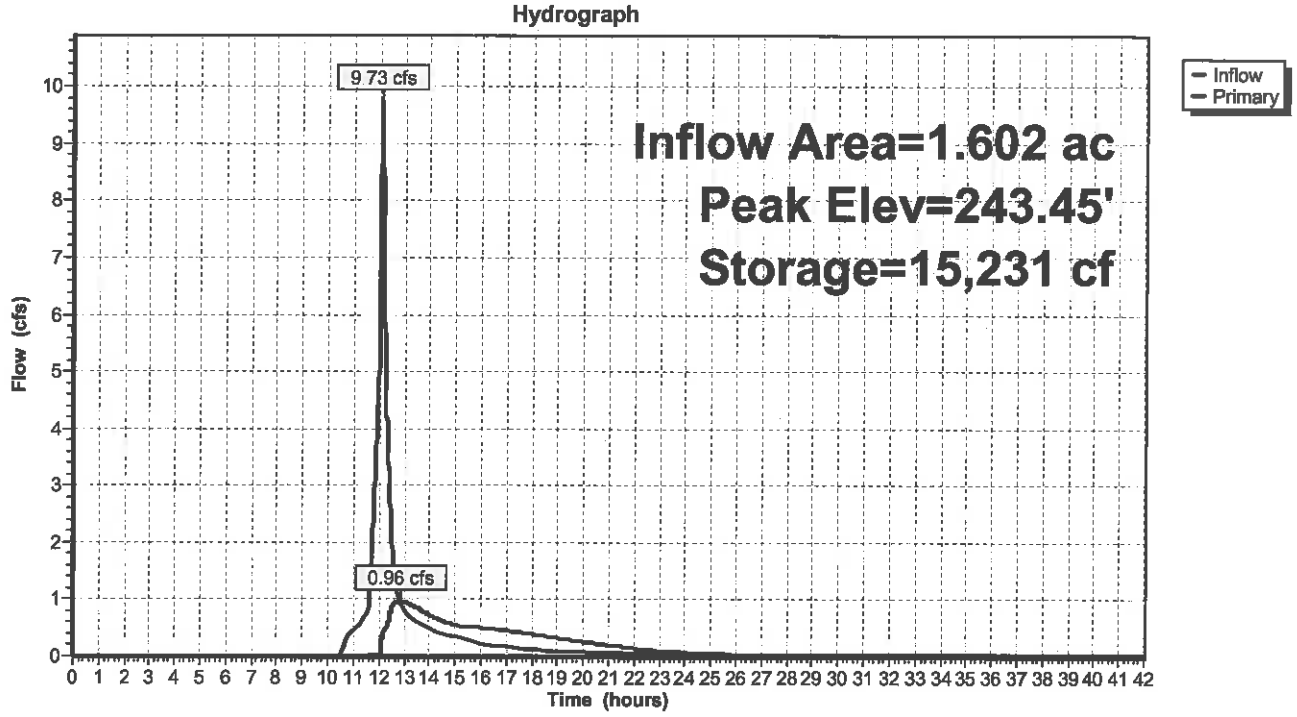
21 Chambers x 590.2 cf + 8,456.8 cf Border = 20,850.6 cf Chamber Storage
21 Chambers x 718.0 cf + 10,728.1 cf Border = 25,805.9 cf Displacement

Chamber Storage = 20,850.6 cf = 0.479 af
Overall Storage Efficiency = 80.8%

21 Chambers (plus border)
955.8 cy Field



Pond DB2: Detention Basin#2



Summary for Pond R1: Recharger #1

Inflow Area =	0.298 ac, 62.97% Impervious, Inflow Depth = 5.36"	for 100 Year Storm event		
Inflow =	1.83 cfs @ 12.07 hrs, Volume=	0.133 af		
Outflow =	1.45 cfs @ 12.13 hrs, Volume=	0.133 af, Atten= 21%, Lag= 3.4 min		
Discarded =	0.11 cfs @ 10.99 hrs, Volume=	0.096 af		
Primary =	1.34 cfs @ 12.13 hrs, Volume=	0.037 af		

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 239.77' @ 12.13 hrs Surf.Area= 565 sf Storage= 1,142 cf

Plug-Flow detention time= 45.7 min calculated for 0.133 af (100% of inflow)
Center-of-Mass det. time= 45.7 min (825.9 - 780.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	236.50'	533 cf	**21.33'W x 26.50'L x 3.54'H Field A** 2,002 cf Overall - 671 cf Embedded = 1,332 cf x 40.0% Voids
#2A	237.00'	671 cf	**Cultec R-330XLHD** x 12 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		1,203 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	236.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	238.80'	**8.0" Round Culvert** L= 17.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 238.80' / 237.00' S= 0.1059 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.11 cfs @ 10.99 hrs HW=236.54' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=1.34 cfs @ 12.13 hrs HW=239.77' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 1.34 cfs @ 3.85 fps)

Pond R1: Recharger #1 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

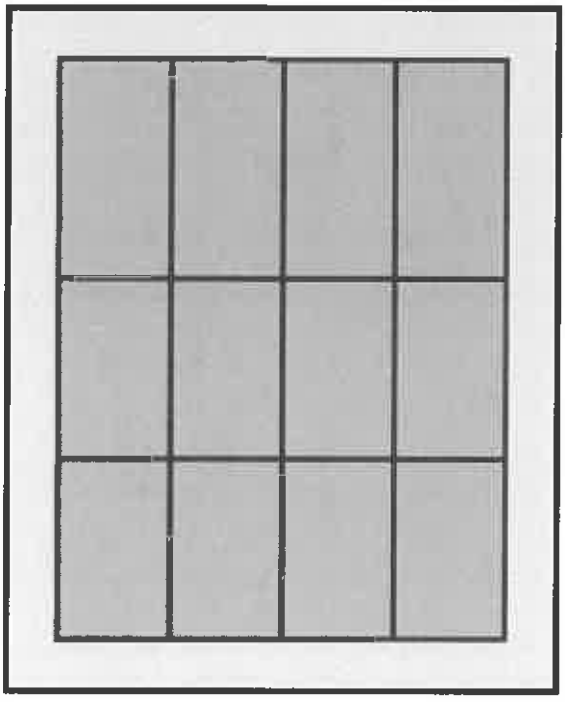
3 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 22.50' Row Length +24.0" End Stone x 2 = 26.50' Base Length
4 Rows x 52.0" Wide + 24.0" Side Stone x 2 = 21.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 670.6 cf Chamber Storage

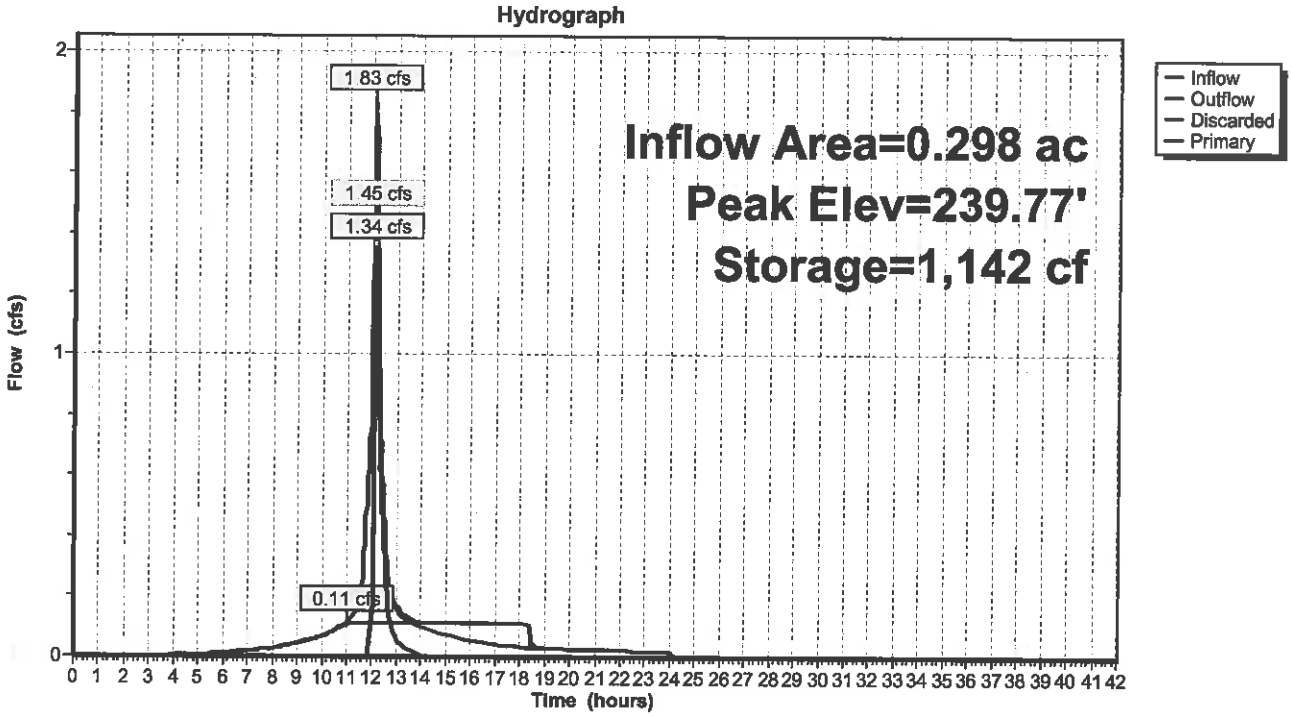
2,002.2 cf Field - 670.6 cf Chambers = 1,331.6 cf Stone x 40.0% Voids = 532.7 cf Stone Storage

Chamber Storage + Stone Storage = 1,203.2 cf = 0.028 af
Overall Storage Efficiency = 60.1%

12 Chambers
74.2 cy Field
49.3 cy Stone



Pond R1: Recharger #1



Summary for Pond R2: Recharger #2

Inflow Area = 0.837 ac, 80.31% Impervious, Inflow Depth = 5.85" for 100 Year Storm event
Inflow = 5.45 cfs @ 12.07 hrs, Volume= 0.408 af
Outflow = 4.83 cfs @ 12.11 hrs, Volume= 0.407 af, Atten= 11%, Lag= 2.3 min
Discarded = 0.03 cfs @ 4.58 hrs, Volume= 0.092 af
Primary = 4.81 cfs @ 12.11 hrs, Volume= 0.315 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 246.98' @ 12.11 hrs Surf.Area= 1,219 sf Storage= 2,671 cf

Plug-Flow detention time= 156.1 min calculated for 0.407 af (100% of inflow)
Center-of-Mass det. time= 154.8 min (920.9 - 766.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	243.50'	1,079 cf	**25.67'W x 47.50'L x 3.54'H Field A** 4,318 cf Overall - 1,621 cf Embedded = 2,697 cf x 40.0% Voids
#2A	244.00'	1,621 cf	**Cultec R-330XLHD** x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
		2,700 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	243.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	245.70'	**6.0" Round Culvert X 5.00** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 245.70' / 245.40' S= 0.0231 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.03 cfs @ 4.58 hrs HW=243.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=4.80 cfs @ 12.11 hrs HW=246.98' (Free Discharge)
↑**2=Culvert** (Inlet Controls 4.80 cfs @ 4.89 fps)

Pond R2: Recharger #2 - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

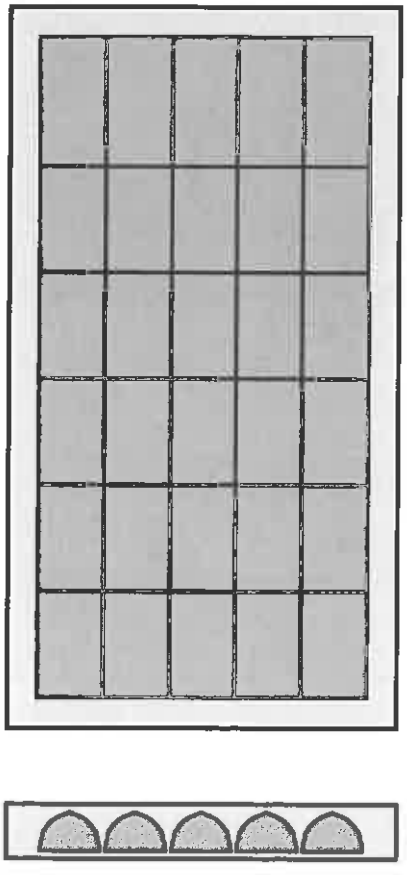
6 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 43.50' Row Length +24.0" End Stone x 2 = 47.50' Base Length
5 Rows x 52.0" Wide + 24.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

30 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 1,620.6 cf Chamber Storage

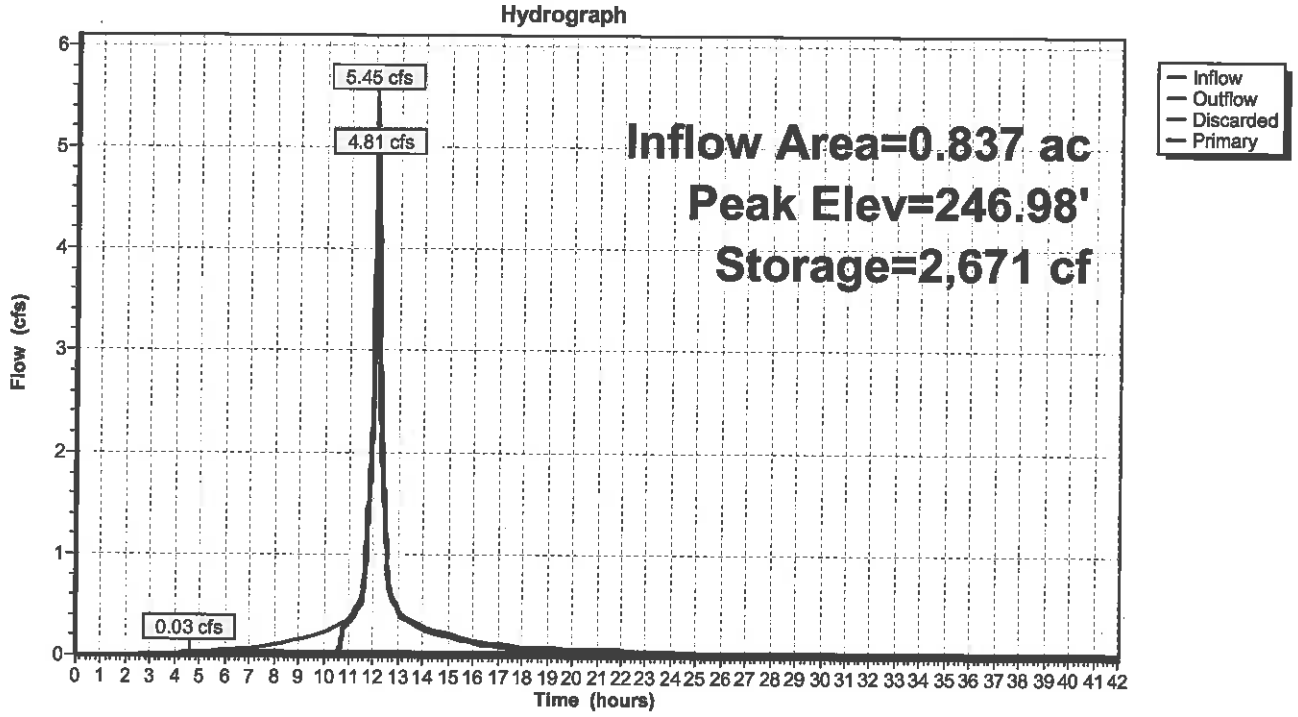
4,317.9 cf Field - 1,620.6 cf Chambers = 2,697.3 cf Stone x 40.0% Voids = 1,078.9 cf Stone Storage

Chamber Storage + Stone Storage = 2,699.5 cf = 0.062 af
Overall Storage Efficiency = 62.5%

30 Chambers
159.9 cy Field
99.9 cy Stone



Pond R2: Recharger #2



Summary for Pond R3: Recharger #3

Inflow Area = 0.693 ac, 89.49% Impervious, Inflow Depth = 6.13" for 100 Year Storm event
Inflow = 4.60 cfs @ 12.07 hrs, Volume= 0.353 af
Outflow = 4.19 cfs @ 12.10 hrs, Volume= 0.354 af, Atten= 9%, Lag= 2.0 min
Discarded = 0.02 cfs @ 3.61 hrs, Volume= 0.075 af
Primary = 4.16 cfs @ 12.10 hrs, Volume= 0.279 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 250.11' @ 12.10 hrs Surf.Area= 1,056 sf Storage= 2,220 cf

Plug-Flow detention time= 125.2 min calculated for 0.353 af (100% of inflow)
Center-of-Mass det. time= 125.5 min (880.8 - 755.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	246.50'	825 cf	**24.00'W x 44.00'L x 4.00'H Field A** 4,224 cf Overall - 2,162 cf Embedded = 2,062 cf x 40.0% Voids
#2A	247.00'	1,560 cf	**Galley 4x4x3** x 50 Inside #1 Inside= 42.0"W x 30.0"H => 8.91 sf x 3.50'L = 31.2 cf Outside= 48.0"W x 36.0"H => 10.81 sf x 4.00'L = 43.2 cf 5 Rows of 10 Chambers
		2,384 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	246.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	248.40'	**12.0" Round Culvert** L= 194.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 248.40' / 244.70' S= 0.0191 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.02 cfs @ 3.61 hrs HW=246.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=4.16 cfs @ 12.10 hrs HW=250.11' (Free Discharge)
↑**2=Culvert** (Inlet Controls 4.16 cfs @ 5.29 fps)

Pond R3: Recharger #3 - Chamber Wizard Field A

Chamber Model = Galley 4x4x3 (Concrete Galley, Shea LE-EGLPH, LE-CGLPH or equivalent)
Inside= 42.0"W x 30.0"H => 8.91 sf x 3.50'L = 31.2 cf
Outside= 48.0"W x 36.0"H => 10.81 sf x 4.00'L = 43.2 cf

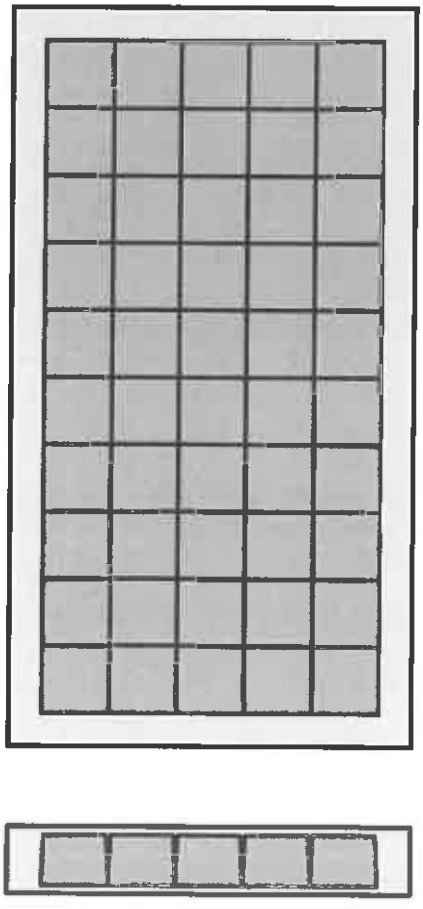
10 Chambers/Row x 4.00' Long = 40.00' Row Length +24.0" End Stone x 2 = 44.00' Base Length
5 Rows x 48.0" Wide + 24.0" Side Stone x 2 = 24.00' Base Width
6.0" Base + 36.0" Chamber Height + 6.0" Cover = 4.00' Field Height

50 Chambers x 31.2 cf = 1,559.6 cf Chamber Storage
50 Chambers x 43.2 cf = 2,161.8 cf Displacement

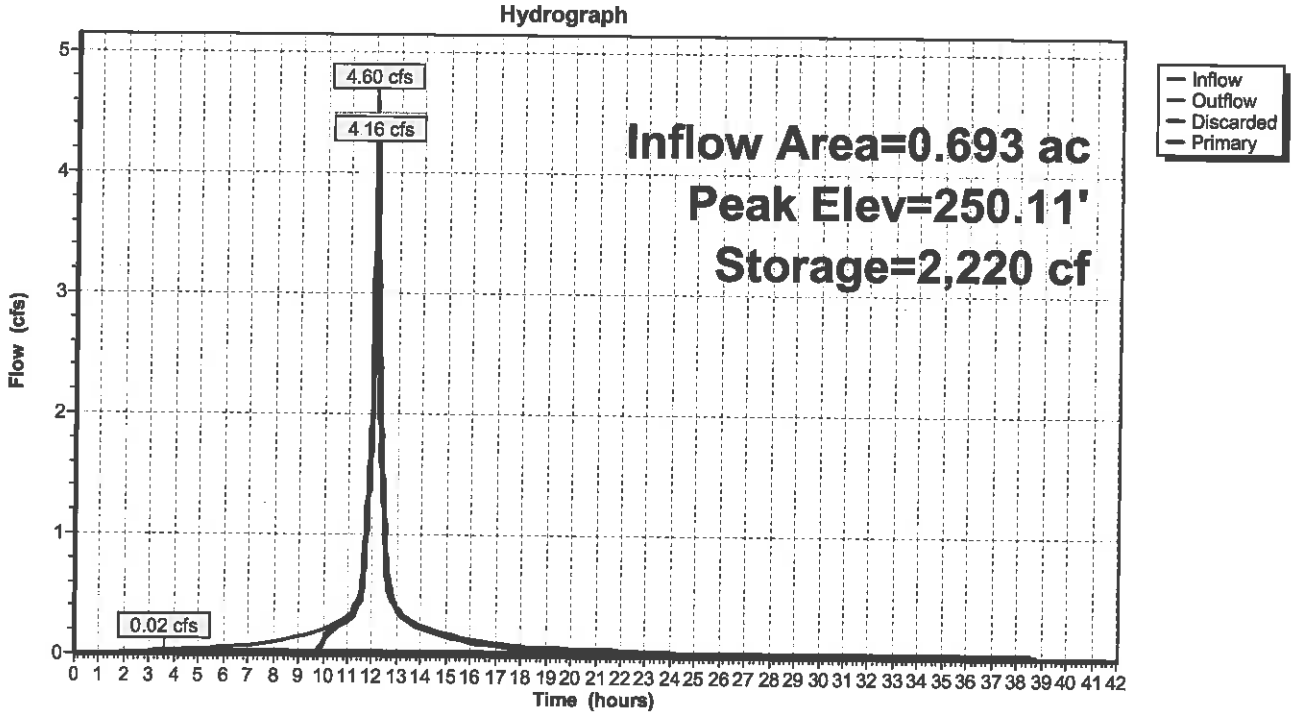
4,224.0 cf Field - 2,161.8 cf Chambers = 2,062.2 cf Stone x 40.0% Voids = 824.9 cf Stone Storage

Chamber Storage + Stone Storage = 2,384.5 cf = 0.055 af
Overall Storage Efficiency = 56.5%

50 Chambers
156.4 cy Field
76.4 cy Stone



Pond R3: Recharger #3



Summary for Pond R4: Recharger #4

Inflow Area = 0.168 ac,100.00% Impervious, Inflow Depth = 6.36" for 100 Year Storm event
Inflow = 1.13 cfs @ 12.07 hrs, Volume= 0.089 af
Outflow = 0.41 cfs @ 12.30 hrs, Volume= 0.089 af, Atten= 64%, Lag= 13.8 min
Discarded = 0.03 cfs @ 7.97 hrs, Volume= 0.063 af
Primary = 0.38 cfs @ 12.30 hrs, Volume= 0.026 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 256.75' @ 12.30 hrs Surf.Area= 1,108 sf Storage= 1,501 cf

Plug-Flow detention time= 303.9 min calculated for 0.089 af (100% of inflow)
Center-of-Mass det. time= 304.0 min (1,046.8 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	254.80'	900 cf	**23.58'W x 47.00'L x 3.21'H Field A**
			3,556 cf Overall - 1,305 cf Embedded = 2,251 cf x 40.0% Voids
#2A	255.30'	1,305 cf	**Cultec R-280HD** x 30 Inside #1
			Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
			Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
			Row Length Adjustment= +1.00' x 6.07 sf x 5 rows
		2,206 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	254.80'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	256.40'	**8.0" Round Culvert**
			L= 17.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 256.40' / 256.00' S= 0.0235 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.03 cfs @ 7.97 hrs HW=254.83' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.38 cfs @ 12.30 hrs HW=256.75' (Free Discharge)
↑**2=Culvert** (Inlet Controls 0.38 cfs @ 2.03 fps)

Pond R4: Recharger #4 - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 5 rows

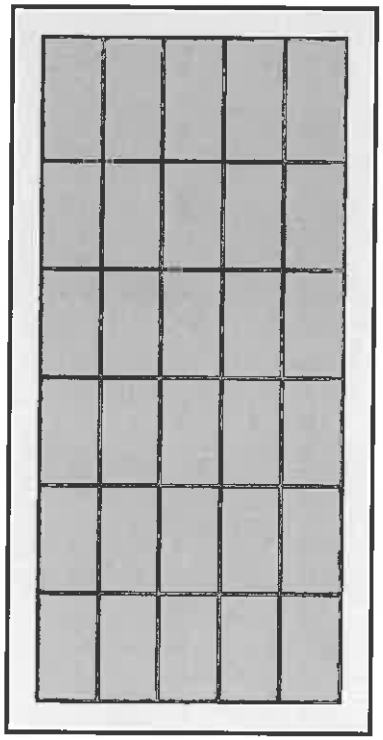
6 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 43.00' Row Length +24.0" End Stone x 2 = 47.00' Base Length
5 Rows x 47.0" Wide + 24.0" Side Stone x 2 = 23.58' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

30 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 5 Rows = 1,305.4 cf Chamber Storage

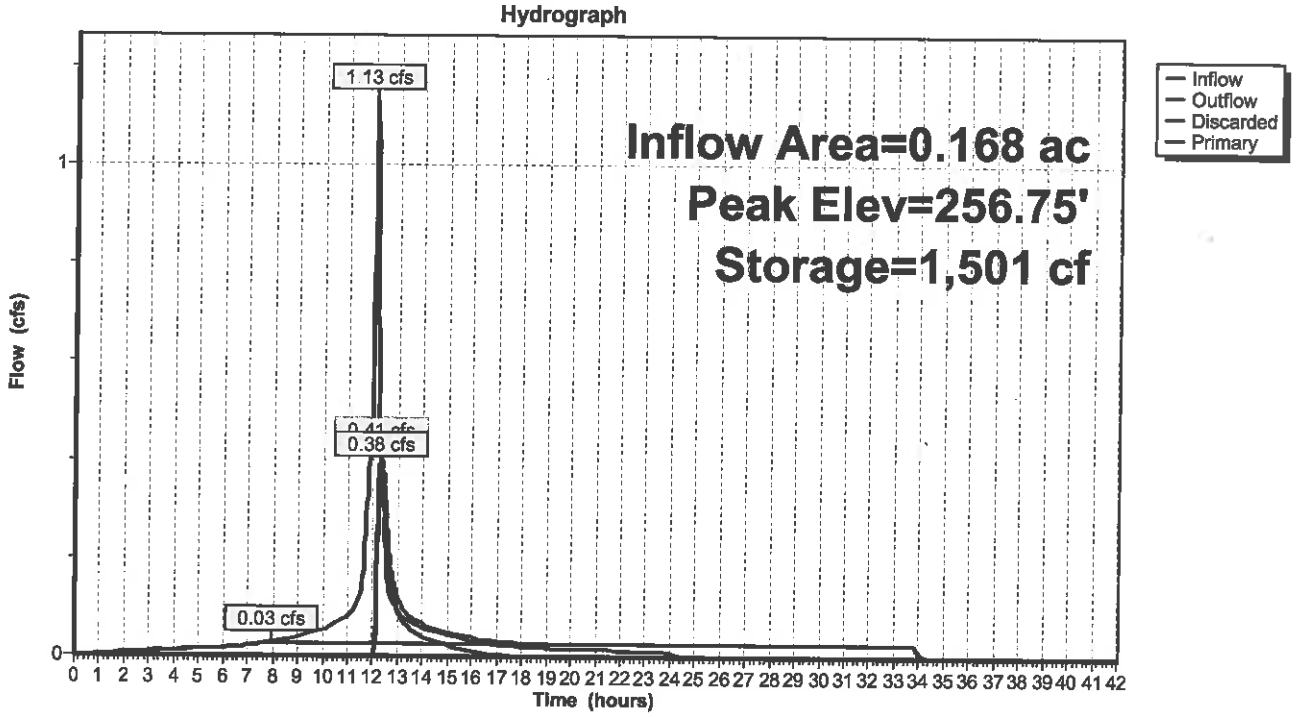
3,556.2 cf Field - 1,305.4 cf Chambers = 2,250.7 cf Stone x 40.0% Voids = 900.3 cf Stone Storage

Chamber Storage + Stone Storage = 2,205.7 cf = 0.051 af
Overall Storage Efficiency = 62.0%

30 Chambers
131.7 cy Field
83.4 cy Stone



Pond R4: Recharger #4



Summary for Pond R5: Recharger #5

Inflow Area = 1.239 ac, 80.86% Impervious, Inflow Depth = 5.66" for 100 Year Storm event
Inflow = 7.88 cfs @ 12.07 hrs, Volume= 0.584 af
Outflow = 7.45 cfs @ 12.10 hrs, Volume= 0.572 af, Atten= 6%, Lag= 1.6 min
Discarded = 0.03 cfs @ 4.47 hrs, Volume= 0.101 af
Primary = 7.42 cfs @ 12.10 hrs, Volume= 0.471 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 245.26' @ 12.10 hrs Surf.Area= 1,320 sf Storage= 3,648 cf

Plug-Flow detention time= 139.0 min calculated for 0.572 af (98% of inflow)
Center-of-Mass det. time= 126.0 min (896.4 - 770.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	240.80'	1,376 cf	**22.00'W x 60.00'L x 5.25'H Field A** 6,930 cf Overall - 3,491 cf Embedded = 3,439 cf x 40.0% Voids
#2A	241.30'	2,597 cf	**Galley 4x4x4.25** x 56 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf 4 Rows of 14 Chambers
		3,973 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	240.80'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	243.80'	**12.0" Round Culvert X 2.00** L= 17.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 243.80' / 243.50' S= 0.0176 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.03 cfs @ 4.47 hrs HW=240.85' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=7.40 cfs @ 12.10 hrs HW=245.26' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 7.40 cfs @ 4.71 fps)

Pond R5: Recharger #5 - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

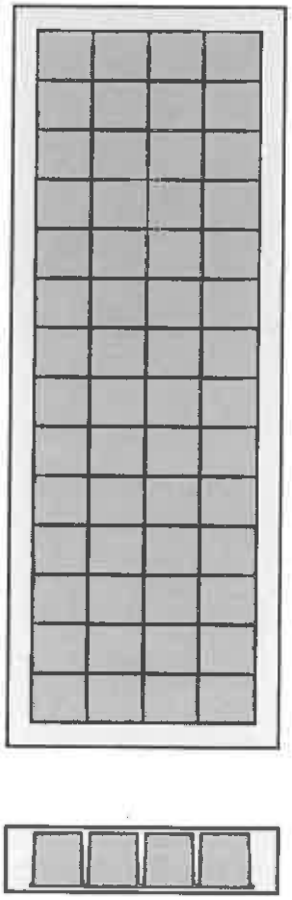
14 Chambers/Row x 4.00' Long = 56.00' Row Length +24.0" End Stone x 2 = 60.00' Base Length
4 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 22.00' Base Width
6.0" Base + 51.0" Chamber Height + 6.0" Cover = 5.25' Field Height

56 Chambers x 46.4 cf = 2,597.3 cf Chamber Storage
56 Chambers x 62.3 cf = 3,490.6 cf Displacement

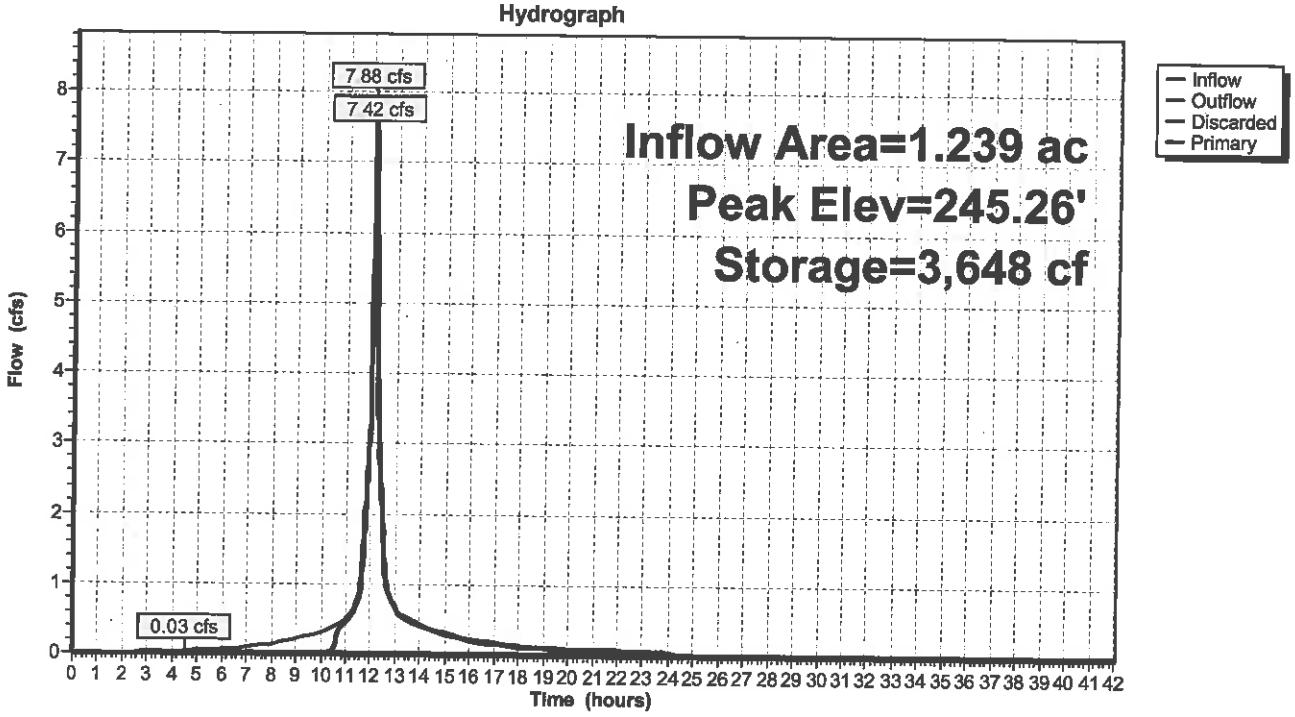
6,930.0 cf Field - 3,490.6 cf Chambers = 3,439.4 cf Stone x 40.0% Voids = 1,375.8 cf Stone Storage

Chamber Storage + Stone Storage = 3,973.1 cf = 0.091 af
Overall Storage Efficiency = 57.3%

56 Chambers
256.7 cy Field
127.4 cy Stone



Pond R5: Recharger #5



Summary for Pond R6: Recharger #6

Inflow Area = 0.363 ac,100.00% Impervious, Inflow Depth = 6.36" for 100 Year Storm event
Inflow = 2.43 cfs @ 12.07 hrs, Volume= 0.192 af
Outflow = 2.36 cfs @ 12.09 hrs, Volume= 0.192 af, Atten= 3%, Lag= 1.1 min
Discarded = 0.03 cfs @ 5.62 hrs, Volume= 0.084 af
Primary = 2.33 cfs @ 12.09 hrs, Volume= 0.108 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 251.14' @ 12.09 hrs Surf.Area= 1,358 sf Storage= 1,584 cf

Plug-Flow detention time= 177.7 min calculated for 0.192 af (100% of inflow)
Center-of-Mass det. time= 177.7 min (920.5 - 742.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	249.30'	713 cf	**20.50'W x 66.25'L x 2.04'H Field A** 2,773 cf Overall - 989 cf Embedded = 1,783 cf x 40.0% Voids
#2A	249.80'	989 cf	**Cultec R-150XLHD** x 36 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 6 rows
		1,703 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.30'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	250.80'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.03 cfs @ 5.62 hrs HW=249.32' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=2.32 cfs @ 12.09 hrs HW=251.14' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.32 cfs @ 1.69 fps)

Pond R6: Recharger #6 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 6 rows

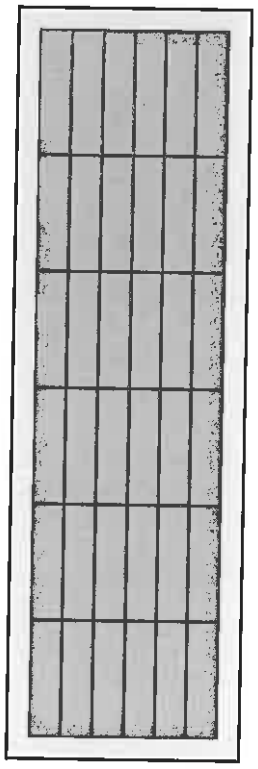
6 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 62.25' Row Length +24.0" End Stone x 2 = 66.25' Base Length
6 Rows x 33.0" Wide + 24.0" Side Stone x 2 = 20.50' Base Width
6.0" Base + 18.5" Chamber Height = 2.04' Field Height

36 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 6 Rows = 989.4 cf Chamber Storage

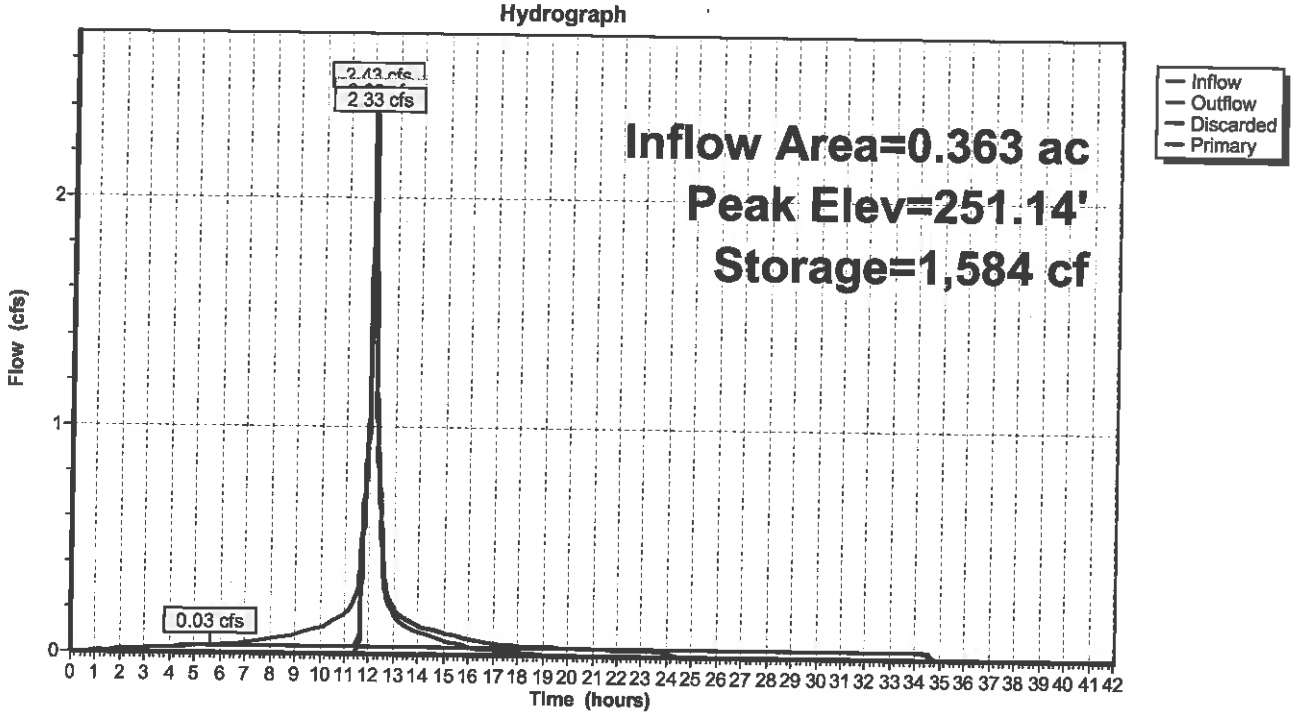
2,772.8 cf Field - 989.4 cf Chambers = 1,783.4 cf Stone x 40.0% Voids = 713.4 cf Stone Storage

Chamber Storage + Stone Storage = 1,702.8 cf = 0.039 af
Overall Storage Efficiency = 61.4%

36 Chambers
102.7 cy Field
66.1 cy Stone



Pond R6: Recharger #6



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APPENDIX 1

Soils Information:

1.1 NRCS soils information for Middlesex County

1.2 Soil Test Data by Schofield Brothers LLC
(Testing performed on August 6 and November 17, 2015)

Soil Map—Middlesex County, Massachusetts

Map Scale: 1:5,130 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 14, Sep 19, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	28.0	27.4%
602	Urban land	10.0	9.8%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	15.7	15.4%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	48.4	47.4%
Totals for Area of Interest		102.2	100.0%

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Middlesex County, Massachusetts

103B—Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 98yc
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 50 percent
Hollis and similar soils: 25 percent
Rock outcrop: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A

Description of Hollis

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D

Description of Rock Outcrop

Setting

Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Granite and gneiss

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Minor Components

Canton

Percent of map unit: 2 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex

Woodbridge

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, toeslope, summit

Landform position (three-dimensional): Head slope, base slope, nose slope
Down-slope shape: Linear
Across-slope shape: Concave

Scituate
Percent of map unit: 2 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave

Narragansett
Percent of map unit: 2 percent
Landform: Hills, ridges
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex

Unnamed
Percent of map unit: 1 percent

Montauk
Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Head slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex

602—Urban land

Map Unit Setting
National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Udorthents, wet substratum
Percent of map unit: 5 percent

Udorthents, loamy
Percent of map unit: 5 percent

Rock outcrop
Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9957
Elevation: 0 to 2,100 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Merrimac and similar soils: 40 percent
Urban land: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Description of Merrimac

Setting
Landform: Terraces, plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over loose sandy glaciofluvial deposits derived from granite and gneiss

Typical profile

H1 - 0 to 9 inches: fine sandy loam
H2 - 9 to 18 inches: gravelly sandy loam
H3 - 18 to 26 inches: very gravelly loamy coarse sand
H4 - 26 to 33 inches: stratified extremely gravelly coarse sand
H5 - 33 to 65 inches: stratified gravelly coarse sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A

Minor Components

Sudbury

Percent of map unit: 10 percent
Landform: Terraces, plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Concave

Windsor

Percent of map unit: 5 percent
Landform: Deltas, terraces, flats
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex

Hinckley

Percent of map unit: 5 percent
Landform: Ridges, eskers, terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex

631C—Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky

Map Unit Setting

National map unit symbol: vr1g
Elevation: 0 to 1,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 40 percent
Charlton and similar soils: 40 percent
Hollis and similar soils: 10 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Description of Hollis

Setting

Landform: Ridges, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D

Minor Components

Canton

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex

Udorthents, loamy

Percent of map unit: 2 percent

Rock outcrop

Percent of map unit: 2 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Scituate

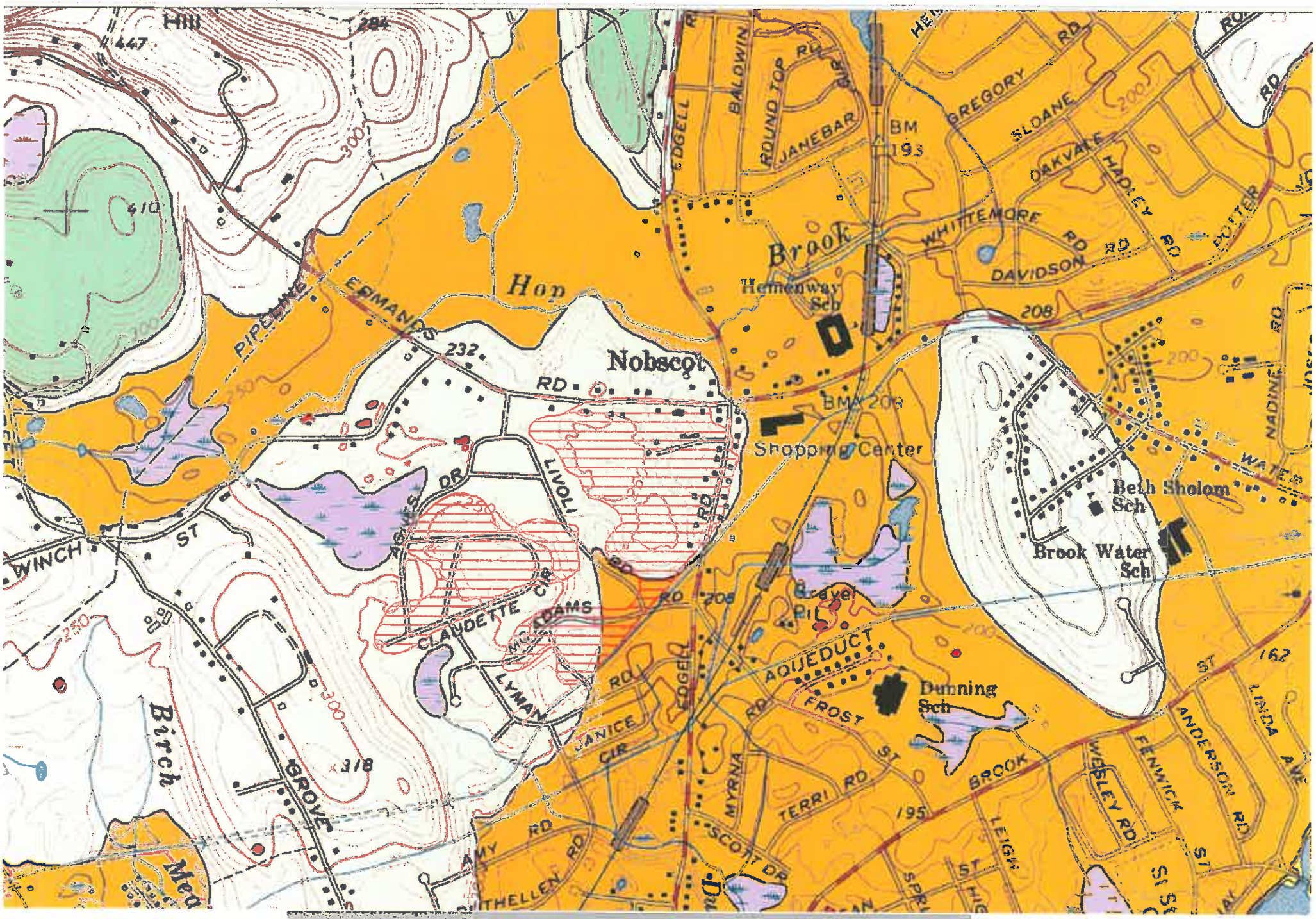
Percent of map unit: 1 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Linear
Across-slope shape: Concave

Montauk

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 14, Sep 19, 2014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DAVIDSON
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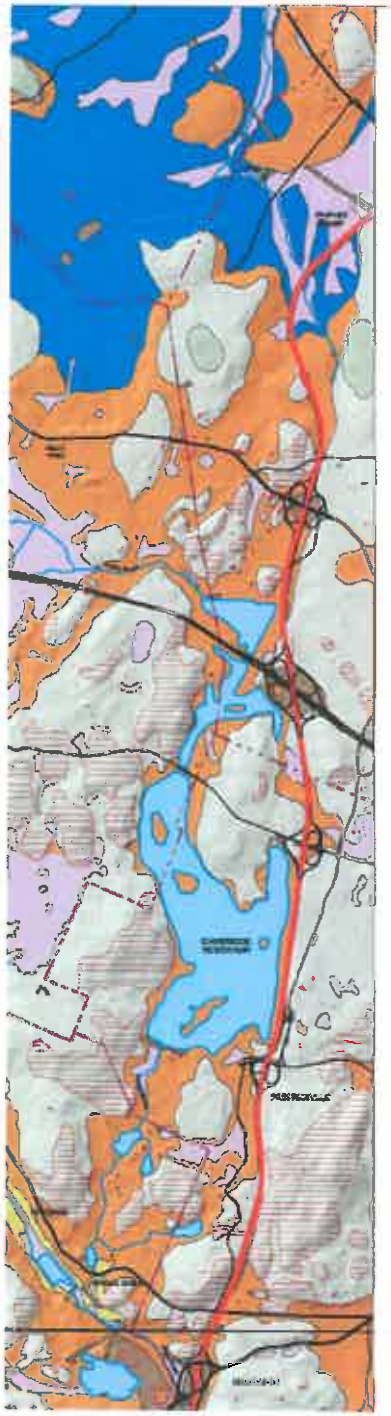

POSTGLACIAL DEPOSITS

Artificial fill—Earth materials and manmade materials that have been artificially emplaced, primarily in highway and railroad embankments, and in dams; may also include landfills, urban development areas, and filled coastal wetlands.

Floodplain alluvium—Sand, gravel, silt, and some organic material, stratified and well sorted to poorly sorted, beneath the floodplains of modern streams. The texture of alluvium commonly varies over short distances both laterally and vertically, and generally is similar to the texture of adjacent glacial deposits. Along smaller streams, alluvium is commonly less than 5 ft thick. The most extensive deposit of alluvium on the map is along the Charles, Assabet, and Concord Rivers where the texture is predominantly sand, fine gravel, and silt, and total thickness is as much as 25 ft. Alluvium typically overlies thicker glacial stratified deposits.

Swamp deposits—Organic muck and peat that contain minor amounts of sand, silt, and clay, stratified and poorly sorted, in kettle depressions or poorly drained areas. Most swamp deposits are less than about 10 ft thick. Swamp deposits overlie glacial deposits or bedrock. They locally overlie glacial till even where they occur within thin glacial meltwater deposits.

GLACIAL STRATIFIED DEPOSITS

Sorted and stratified sediments composed of gravel, sand, silt, and clay (as defined in particle size diagram) deposited in layers by glacial meltwater. These sediments occur as four basic textural units—gravel deposits, sand and gravel deposits, sand deposits, and fine deposits. On this interim map, gravel, sand and gravel, and sand deposits are not differentiated and are shown as *Coarse Deposits* where they occur at land surface. *Fine Deposits* also are shown where they occur at land surface. **Textural changes occur both areally and vertically (fig. 2), however subsurface textural variations are not shown on this interim map.**

Coarse deposits include: *Gravel deposits* composed mainly of gravel-sized clasts; cobbles and boulders predominate; minor amounts of sand within gravel beds, and sand comprises few separate layers. Gravel layers generally are poorly sorted and bedding commonly is distorted and faulted due to postdepositional collapse related to melting of ice. *Sand and gravel deposits* composed of mixtures of gravel and sand within individual layers and as alternating layers. Sand and gravel layers generally range from 25 to 50 percent gravel particles and from 50 to 75 percent sand particles. Layers are well to poorly sorted; bedding may be distorted and faulted due to postdepositional collapse. *Sand deposits* composed mainly of very coarse to fine sand, commonly in well-sorted layers. Coarser layers may contain up to 25 percent gravel particles, generally granules and pebbles; finer layers may contain some very fine sand, silt, and clay.

Fine deposits include very fine sand, silt, and clay that occurs as well-sorted, thin layers of alternating silt and clay, or thicker layers of very fine sand and silt. Very fine sand commonly occurs at the surface and grades downward into rhythmically bedded silt and clay varves. Locally, this map unit may include areas underlain by fine sand.

GLACIAL TILL DEPOSITS

Thin till—Nonsorted, nonstratified matrix of sand, some silt, and little

See explanatory pamphlet for references

Clinton Quadrangle
Map units were reproduced from Koteff, 1966. Glacial Stratified quadrangle include deposits of glacial Lakes Nashua, Assabet, and Lec smaller valley deposits. Fine-grained glacial stratified deposits at lar glacial Lake Nashua lake-bottom deposits (unit Qnbb of Koteff, 1966). shown on this map were inferred from photographic image and topogr drumlin symbols shown by Koteff (1966).

Hudson and Maynard Quadrangles
Map units were reproduced from Hansen (1956). Glacial Stratifiec quadrangle include various glacial lake and stream deposits. Fi stratified deposits at land surface include lake-bottom deposits of gla (parts of unit Qsg of Hansen, 1956); this unit has been extended bene bodies and postglacial deposits on this map. Drumlin till unit was re published map; other areas of thick till were inferred from photog topographic analysis.

Concord Quadrangle
Map units were reproduced from Koteff (1964). Glacial Stratified quadrangle include deposits of glacial lakes Sudbury and Concord, valley deposits. Fine-grained glacial stratified deposits at land surf bottom deposits of glacial Lakes Sudbury and Concord (unit Qlsb ar 1964); these units have been extended beneath adjacent water bodi deposits on this map. Thick till areas shown on this map were inferred image and topographic analysis and drumlin symbols shown by Koteff

Shrewsbury Quadrangle
Map units were reproduced from Shaw (1969). Glacial Stratified quadrangle include deposits of glacial Lakes Assabet and Nashua, valley deposits. Thick till areas shown on this map were inferred f image and topographic analysis and drumlin symbols shown by Shaw (

Marlborough Quadrangle
Stone, B.D., 1982, Unpublished field maps
Hildreth, C.T., and Stone, B.D., 2004, Surficial geologic map of the Ma Quadrangle, unpublished data.

Framingham Quadrangle
Map units were reproduced from Nelson (1974). Glacial Stratifiec quadrangle include deposits of glacial Lakes Charles and Sudbury, valley deposits. Fine-grained glacial stratified deposits at land sur bottom deposits of glacial Lakes Sudbury and Charles (unit Qlsb an 1974); these units have been extended beneath adjacent water bodi deposits on this map. Some contacts between till and glacial stratified modified from Nelson (1974). Thick till areas shown on this map v photographic image and topographic analysis and drumlin symbols (1974).

Natick Quadrangle
Map units were reproduced from Nelson (1974). Glacial Stratifiec quadrangle include deposits of glacial Lakes Charles and Sudbury, valley deposits. Fine-grained glacial stratified deposits at land sur bottom deposits of glacial lake Sudbury (unit Qlsb of Nelson, 1974); extended beneath adjacent water bodies and postglacial deposits on tl areas shown on this map were inferred from photographic image analysis and drumlin symbols shown by Nelson (1974).

sorted, thin layers of alternating silt and clay, or thicker layers of very fine sand and silt. Very fine sand commonly occurs at the surface and grades downward into rhythmically bedded silt and clay varves. Locally, this map unit may include areas underlain by fine sand.

GLACIAL TILL DEPOSITS

Thin till—Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders; in areas where till is generally less than 10-15 ft thick and including areas of bedrock outcrop where till is absent. Predominantly upper till of the last glaciation; loose to moderately compact, generally sandy, commonly stony. Two facies are present in some places; a looser, coarser-grained ablation facies, melted out from supraglacial position; and an underlying more compact, finer-grained lodgement facies deposited subglacially. In general, both ablation and lodgement facies of upper till derived from fine-grained bedrock are finer grained, more compact, less stony and have fewer surface boulders than upper till derived from coarser grained crystalline rocks. Fine-grained bedrock sources include the red Mesozoic sedimentary rocks of the Connecticut River lowland, marble in the western river valleys, and fine-grained schists in upland areas.

Thick till— Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders at the surface; in the shallow subsurface, compact, nonsorted matrix of silt, very fine sand, and some clay containing scattered small gravel clasts in areas where till is greater than 10-15 ft thick, chiefly in drumlin landforms in which till thickness commonly exceeds 100 ft (maximum recorded thickness is 230 ft). Although upper till is the surface deposit, the lower till constitutes the bulk of the material in these areas. Lower till is moderately to very compact, and is commonly finer-grained and less stony than upper till. An oxidized zone, the lower part of a soil profile formed during a period of interglacial weathering, is generally present in the upper part of the lower till. This zone commonly shows closely spaced joints that are stained with iron and manganese oxides.

BEDROCK AREAS

Bedrock outcrops and areas of abundant outcrop or shallow bedrock— Solid color shows extent of individual bedrock outcrops; line pattern indicates areas of shallow bedrock or areas where small outcrops are too numerous to map individually; in areas of shallow bedrock, surficial materials are less than 5 ft thick.

PARTICLE DIAMETER										
10	2.5	0.16	0.08	0.04	0.02	0.01	0.005	0.0025	0.00015	in.
256	64	4	2	1	0.5	0.25	0.125	0.063	0.004	mm
Boulders	Cobbles	Pebbles	Granules	Very coarse sand	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
GRAVEL PARTICLES				SAND PARTICLES				FINE PARTICLES		

Grain-size classification used in this report, modified from Wentworth (1922)

Natick Quadrangle
Map units were reproduced from Nelson (1974). Glacial Stratifiec quadrangle include deposits of glacial Lakes Charles and Sudbury. valley deposits. Fine-grained glacial stratified deposits at land sur bottom deposits of glacial lake Sudbury (unit Qlsb of Nelson, 1974); extended beneath adjacent water bodies and postglacial deposits on t areas shown on this map were inferred from photographic image analysis and drumlin symbols shown by Nelson (1974).

Grafton Quadrangle
Haselton, G.M., and Fontaine, E., 1982, Unpublished field maps
Distribution of bedrock outcrops from Walsh, G.W., 2005, Bedrock G Grafton quadrangle, unpublished data.

Milford Quadrangle
Haselton, G.M., and Fontaine, E., 1982, Unpublished field map

Holliston Quadrangle
Map units were reproduced from Volckman (1975). Glacial Stratifie quadrangle include deposits of glacial Lake Medfield, and other small Fine-grained glacial stratified deposits at land surface include lake-b glacial Lake Medfield (unit Qm2 of Volckman, 1975); this unit b beneath adjacent water bodies and postglacial deposits on this ma shown on this map were inferred from photographic image and topogr drumlin symbols shown by Volckman (1975).

Medfield Quadrangle
Map units were reproduced from Volckman (1975). Glacial Stratifie quadrangle include deposits of glacial Lake Medfield, and other small Thick till areas shown on this map were inferred from photogr topographic analysis and drumlin symbols shown by Volckman (1975)

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Schofield Brothers LLC
1071 Worcester Road
Framingham, MA 01701
Tel: (508) 879-0030
mail@schofieldbros.com

November 30, 2015

24800

Peter Lewandowski
LR Design, INC.
64 Allston Street
Cambridge, MA 02135

RE: Soil Test Results at 82 Edmands Road Framingham, MA

Dear Mr. Lewandowski:

Enclosed please find a soil test report for the preliminary, unwitnessed, soil testing conducted by our office on August 6, 2015, November 17, 2015, and November 18, 2015. The testing was conducted over a broad area of the site to provide an assessment of the soils for stormwater management design and general project planning purposes. DJ Morris provided the excavation service.

This report includes:

1. NRCS Soils Map and soil classification.
2. Soil logs for the twenty-three (23) deep test-holes using the MassDEP standard Form 11 for Soil Suitability Assessment. (TH 15-01 – TH 15-23)
3. Results of the six (6) permeability test to determine the infiltration rate.
4. Sketch plan of the test hole (aka test pit), permeability test, and monitor well locations.

Summary:

- The substratum soil is predominately a very compact fine sandy loam, although a patch of very gravelly sand was found I the northeast corner of the site.
- Based on redoximorphic features (aka soil mottling) that were observed in some of the holes, there is a perched water table approximately 2-3 feet below the surface in the southern portion of the site, but was determined inconclusive in the northern portion. Monitor wells were installed to permit future monitoring of groundwater during high groundwater season (March, April).
- Ledge was encountered in numerous holes before a suitable depth for storm water infiltration purposed.
- There was no standing or weeping groundwater observed in any of the test pits.
- The results of the permeability testing of the substrata (C-layer) shows a range from 0.8 in/hr to 4.4 in/hr.

Evaluation:

The southern portion of the site has been an undeveloped wooded area. There are two single family dwelling on the northern portion of the site, with a gravel parking/driveway area. The

wooded area has moderate slopes ranging from 3-15% with many ledge outcroppings located throughout the site.

The locations of the soil types are shown on the NRCS Soils Map. The soil for the site is classified as Charlton-Hollis Rock Outcrop.

Charlton-Hollis soils are moderately well drained soils that have a wide range in depth to the restrictive layer of bedrock. They both are considered glacial till. The substratum soil for the Charlton soil group is a fine sandy loam, while the Hollis series consists of a gravelly fine sandy loam. Charlton-Hollis soil has varied permeability rates and normally has a relatively deep water table. The major limitation for these soils are that they are shallow to bedrock. The on-site soil evaluation confirmed the NRCS published soil data. Refer to the soil logs for detailed information.

Test pits TH 15-01 through TH 15-04, TH 15-08, TH 15-10, and TH 15-16 through TH 15-19 were all consistent with the NRCS description of the Charlton soil series. All of the test pits consisted of a relatively firm sandy loam substrata with cobbles and boulders. Soil redoximorphic features were present in some of the test pits on the southern portion of the site with estimated seasonal high groundwater levels estimated between 27-38" in depth. Monitor wells were installed to permit future monitoring of groundwater during high groundwater season.

Test pits TH 15-05 through TH 15-07, TH 15-09, TH 15-11 through TH 15-12, TH 15-15, and TH 15-20 were all consistent with the NRCS description of the Hollis-rock outcrop soil series. All of the test pits encountered bedrock that ranged from 11 inches to 40 inches below the surface. The bedrock was not rip-able by the backhoe operator.

Test pits TH 15-13, TH 15-14 were also consistent with the NRCS description of the Charlton soil series. These test pits however contained less fines and were classified as a loamy sand. The substrata however was still firm in place and included a mixture of gravel, cobbles, stones, and boulders. Due to lack of redoximorphic features, estimated seasonal high groundwater could not be determined. Monitor wells were installed in both test pits.

Test pits TH 15-21 through TH 15-23, all located at the northeast corner of the property, were also consistent with the NRCS description of the Charlton soil series. These test pits however contained almost no fines and were classified as a medium to course sand. The substrata in these tests pits was loose and subject to cave-ins, and were dug as deep as possible, but could not extend much deeper than 9 feet due to the loose soil. The soil in these test pits included a mixture of gravel, cobbles, stones, and boulders. Due to lack of redoximorphic features, estimated seasonal high groundwater could not be determined. Monitor wells were installed in two of the test pits.

For runoff computation purposes, the extent of the Charlton and Hollis-Rock outcrop is based on NRCS mapping combined with the results of our soil testing. Boundaries of the Charlton soils and the Hollis-Rock outcrop areas are shown on the accompanying plan. Charlton soils are in HSG "A" and the Hollis-Rock outcrop areas are in HSG "D".

To evaluate the on-site soils for their suitability for stormwater recharge purposes, Schofield Brothers LLC conducted field tests to determine the permeability of the soils in the C-layer. The methodology of the testing performed was per the "In-Situ Soil Permeability Test for Use in the Vadose Zone (Constant Head "Stand Pipe Method)" conducted in accordance with the U.S. Army Corp of Engineers, Engineering Manual EM 1110-2-2301 September 30, 1994. The method is based on the U.S. Bureau of Reclamation "Earth Manual (USBR 1985).

The substratum soil (aka parent material, C-layer) consisted of a firm sandy loam to loamy sand. Results of the permeability tests ranged from 0.8 in/hr to 4.4 in/hr. Using 50% of the actual in-situ permeability rate confirms that the soil is suitable for infiltration purposes based solely on permeability rate.

One test was run in the medium to coarse sand found in the northeast corner of the site. During the 15 minute soak period, 24 gallons was added, and the soak could not be maintained. At this location, the soil has rapid permeability.

Conclusion:
Based on the results of our soil evaluation, the NRCS mapping is confirmed. For purposes of hydrologic modeling, the Hydrologic Soil Groups are categorized as HSG "A" and HSG "D" consistent with the NRCS mapping and the results of our soil evaluation. HSG "D" soil is located where the presence of ledge and Hollis soils were observed. Everywhere else, HSG "A" is used, coinciding with Charlton soil.

The presence of ledge throughout the site will impact development. Recharge (infiltration) BMPs and detention basins will need to be located where deeper soil exists.

While redoximorphic features were observed in some of the test pits, it appears that these could be classified as "variegated" indicating a slowing of water as it seeps downward through the soil profile, rather than an indication of an estimated seasonal high groundwater table. Monitor wells were installed in several of the test pits to allow for groundwater reading during the high groundwater season in March and April. For design purposes, the estimated seasonal high groundwater is based on the "variegated" mottling, until monitor well readings with an adjustment factor (Frimpter calculation) indicate that the water table is lower.

If you have any questions regarding the information in this report, please do not hesitate to contact me at 508-879-0030, ext. 224.

Very truly yours,
Schofield Brothers LLC

Bert E. Corey, P.E.
Senior Engineer, Certified Soil Evaluator

Enclosures

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-01 Date: 8/6/15 Time: AM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
0 – 32"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
32 – 54"	C1	Loamy Sand	2.5 Y 6/2	None Observed	Massive-Friable, w/cobbles
54 – 102"	C2	Sandy Loam	2.5 Y 5/3	None Observed	Massive-Very Firm in place, Friable in hand, cobbly, stoney w/ boulders

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-02 Date: 8/6/15 Time: AM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
0 – 24"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
24 – 33"	C1	Loamy Sand	2.5 Y 6/2	> 5% @ 33"	Massive-Friable, w/cobbles
33 – 105"	C2	Sandy Loam	2.5 Y 5/3		Massive-Very Firm in place, Friable in hand, cobbly, stoney w/ boulders

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: @ 33" base on soil morphology

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-03 Date: 8/6/15 Time: AM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
0 – 20"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
20 – 31"	C1	Loamy Sand	2.5 Y 6/2	None Observed	Massive-Friable, w/cobbles
31 – 114"	C2	Sandy Loam	2.5 Y 5/3	None Observed	Massive-Very Firm in place, Friable in hand, cobbly, stoney w/ boulders

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-04 Date: 8/6/15 Time: AM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
0 – 20"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
20 – 27"	C1	Loamy Sand	2.5 Y 6/2	> 5% @ 27"	Massive-Friable, w/cobbles
27 – 108"	C2	Sandy Loam	2.5 Y 5/3		Massive-Very Firm in place, Friable in hand, cobbly, stoney w/ boulders

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: @ 27" based on soil morphology

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-05 Date: 8/6/15 Time: AM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
North					
0 – 20"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
20"	R	Bedrock			
South					
0 – 22"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
22 – 40"	C1	Loamy Sand	2.5 Y 6/2	None Observed	Massive-Friable, w/cobbles
40"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: @ 20" (North) / @ 40" (South)

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: None Observed

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-06 Date: 8/6/15 Time: AM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
0 – 18"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
18 - 39"	C	Sandy Loam	2.5 Y 5/3	None Observed	Massive-Very Firm in place, Friable in hand, cobbly, stoney w/ boulders
39"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: @ 39"

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: None Observed

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-07 Date: 8/6/15 Time: PM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
0 – 11"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
11"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: @ 11"

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: None Observed

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-08 Date: 8/6/15 Time: PM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
8 – 0"	O		10 YR 2/1	None Observed	
0 – 15"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
15 – 34"	C1	Loamy Sand	2.5 Y 6/2	None Observed	Massive-Friable, w/cobbles
34 – 98"	C2	Sandy Loam	2.5 Y 5/3	> 5% @ 38"	Massive-Very Firm in place, Friable in hand, cobbly, stoney w/ boulders

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: @ 38" due to soil morphology

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-09 Date: 8/6/15 Time: PM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
0 – 14"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
14 - 35"	C	Sandy Loam	2.5 Y 5/3	None Observed	Massive-Very Firm in place, Friable in hand, cobbly, stoney w/ boulders
35"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: @ 35"

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-10 Date: 8/6/15 Time: PM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body see sketch Feet Drainageway see sketch Feet

Possible Wet Area see sketch Feet Property Line see sketch Feet

Drinking Water Well see sketch Feet Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
6 – 0"	O		10 YR 2/1	None Observed	
0 – 18"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
18 – 34"	C1	Loamy Sand	2.5 Y 6/2	None Observed	Massive-Friable, w/cobbles
34 – 90"	C2	Sandy Loam	2.5 Y 5/3	None Observed	Massive-Very Firm in place, Friable in hand, cobbly, stoney w/ boulders

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-11 Date: 8/6/15 Time: PM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
0 – 27"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
27"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: @ 27"

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-12 Date: 8/6/15 Time: PM Weather 70°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O		10 YR 2/1	None Observed	
0 – 16"	Bw	Silt Loam	10 YR 5/6	None Observed	Massive-Friable, w/boulders
16 - 29"	C	Sandy Loam	2.5 Y 5/3	None Observed	Massive-Very Firm in place, Friable in hand, cobbly, stoney w/ boulders
29"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: @ 29"

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-13 Date: 11/17/15 Time: AM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Lawn Slope (%) 3-8 Surface Stones Few

Vegetation Lawn w/ some pine and oak trees

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 12"	A	Sandy Loam (Fine)	10 YR 3/3	None Observed	Massive-Friable
12 – 26"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
26 - 34"	C1	Loamy Sand	2.5 Y 5/3	None Observed	Massive-Firm in place, Friable in hand, very gravelly
34 – 66"	C2	Loamy Sand	2.5 Y 5/3	None Observed	Massive-Firm in place, Friable in hand, many cobbles and stones
66 – 114"	C3	Loamy Sand	2.5 Y 5/3	None Observed	Massive-Firm in place, Friable in hand, few cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-14 Date: 11/17/15 Time: AM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Lawn Slope (%) 3-8 Surface Stones Few

Vegetation Lawn w/ some pine and oak trees

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 16"	A	Sandy Loam (Fine)	10 YR 3/3	None Observed	Massive-Friable
16 – 34"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
34 - 76"	C1	Loamy Sand	2.5 Y 5/3	None Observed	Massive-Firm in place, Friable in hand, very gravelly, w/ cobbles
76 – 108"	C2	Loamy Sand	2.5 Y 5/3	None Observed	Massive-Firm in place, Friable in hand, few cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-15 Date: 11/17/15 Time: AM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 6"	A	Sandy Loam (Fine)	10 YR 3/3	None Observed	Massive-Friable
6 – 24"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
24 - 36"	C	Sandy Loam	2.5 Y 5/3	None Observed	
36"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-16 Date: 11/17/15 Time: AM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
4 – 0"	O	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
0 – 14"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
14 - 98"	C	Sandy Loam	2.5 Y 5/2	None Observed	Massive-Firm in place, Friable in hand, some gravel and cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-17 Date: 11/17/15 Time: AM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
0 – 28"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
28 - 96"	C	Sandy Loam	2.5 Y 5/2	None Observed	Massive-Firm in place, Friable in hand, some gravel and cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-18 Date: 11/17/15 Time: PM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
0 – 34"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
34 - 84"	C	Sandy Loam	5 Y 6/2	None Observed	Massive-Firm in place, Friable in hand, many cobbles
84"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-19 Date: 11/17/15 Time: PM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
0 – 30"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
30 - 66"	C	Sandy Loam	5 Y 6/2	None Observed	Massive-Firm in place, Friable in hand, many cobbles, w/ boulders
84"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-20 Date: 11/17/15 Time: PM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Woodland Slope (%) 3-8 Surface Stones Many

Vegetation Pine and oak wooded area

Landform Ground Moraine

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
2 – 0"	O	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
0 – 12"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
84"	R	Bedrock			

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glacial till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-21 Date: 11/18/15 Time: PM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Lawn Slope (%) 3-8 Surface Stones Many

Vegetation Lawn w/ some pine and oak trees

Landform Terrace

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 13"	A	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
13 – 35"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
35 – 108"	C	Sand (Medium-Coarse)	10 YR 5/3	None Observed	Loose-Single Grained, gravelly, w/ some stones and cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Eolian over glaciofluvial deposits Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-22 Date: 11/18/15 Time: PM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Brush and shrubs Slope (%) 3-8 Surface Stones Many

Vegetation Brush and shrubs w/ some pine and oak trees

Landform Terrace

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
5 – 0"	O	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
0 – 16"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
16 – 90"	C	Sand (Medium-Coarse)	10 YR 5/3	None Observed	Loose-Single Grained, gravelly, w/ many stones and cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Eolian over glaciofluvial deposits Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Location Address or Lot No. 82 Edmands Road Framingham, MA 01701

On-site Review-Unwitnessed

Deep Hole Number 15-23 Date: 11/18/15 Time: PM Weather 40°, Sunny

Location (identify on site plan) see attached sketch

Land Use Brush and shrubs Slope (%) 3-8 Surface Stones Many

Vegetation Brush and shrubs w/ some pine and oak trees

Landform Terrace

Position on landscape (sketch on the back) see attached sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 5"	A	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
5 – 35"	Bw	Sandy Loam (Fine)	10 YR 4/6	None Observed	Massive-Friable
35 – 88"	C	Sand (Medium-Coarse)	10 YR 5/3	None Observed	Loose-Single Grained, gravelly, w/ some stones and cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Eolian over glaciofluvial deposits Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None observed Weeping from Pit Face: None observed

Estimated Seasonal High Ground Water: Inconclusive

Permeability Test Pit TH 15-02

Date Performed:	6-Aug-15
Soil Horizon of Perm Test:	C
Depth to water level =	44"
Depth to bottom of tube =	55"
Start Soak:	10:41
Start Test:	10:56

	Time Interval (Minutes)	Incremental Volume(L)
Test 1:	5	1.250
Test 2:	5	0.750
Test 3:	5	1.000
Test 4:	5	0.750
Test 5:	5	0.750
Test 6:	5	0.750
Test 7:	5	0.500
Cumulative Time/Volume	**35**	**5.750**

Q=Cumulative Volume cm^3 / Total time in seconds

Q= 2.738 cm^3/sec

Computation of Permeability(k)

k=Q / 5.5 r Hw=

k=coefficient of permeability (cm/sec)
r=inside radius of pipe in centimeters=
Hw=applied head in centimeters=
Q=Computed flow rate in CC/sec=

10.16 (8" DIA.)
28 cm (11 inches)
2.738 cm^3/sec

k=Q / 5.5 r Hw= 0.00175 cm/sec

2.480 IN/HR
0.041338 IN/MIN
24.19069 MIN/IN

Permeability Test Pit 15-13

Date Performed:	17-Nov-15
Soil Horizon of Perm Test:	C2
Depth to water level =	70"
Depth to bottom of tube =	81"
Start Soak:	10:17
Start Test:	10:32

	Time Interval (Minutes)	Incremental Volume(L)
Test 1:	15	0.750
Test 2:	25	1.000
Test 3:	20	0.750
Cumulative Time/Volume	**60**	**2.500**

Q=Cumulative Volume cm^3 / Total time in seconds

Q= 0.694 cm^3/sec

Computation of Permeability(k)

k=Q / 5.5 r Hw=

k=coefficient of permeability (cm/sec)

r=inside radius of pipe in centimeters= 7.6 (6" DIA.)

Hw=applied head in centimeters= 28 cm (11 inches)

Q=Computed flow rate in CC/sec= 0.694 cm^3/sec

k=Q / 5.5 r Hw= 0.00059 cm/sec 0.841 IN/HR

Permeability Test Pit 15-14

Date Performed:	17-Nov-15
Soil Horizon of Perm Test:	C2
Depth to water level =	79"
Depth to bottom of tube =	90"
Start Soak:	12:00
Start Test:	12:15

	Time Interval (Minutes)	Incremental Volume(L)
Test 1:	5	1.000
Test 2:	5	0.750
Test 3:	5	0.750
Test 4:	5	0.750
Test 5:	5	0.750
Test 6:	5	0.750
Test 7:	5	0.750
Cumulative Time/Volume	**35**	**5.500**

Q=Cumulative Volume cm^3 / Total time in seconds

Q= 2.619 cm^3/sec

Computation of Permeability(k)

k=Q / 5.5 r Hw=

k=coefficient of permeability (cm/sec)
r=inside radius of pipe in centimeters= 7.6 (6" DIA.)
Hw=applied head in centimeters= 28 cm (11 inches)
Q=Computed flow rate in CC/sec= 2.619 cm^3/sec

k=Q / 5.5 r Hw= **0.00224 cm/sec** 3.172 IN/HR

Permeability Test Pit 15-16

Date Performed:	17-Nov-15
Soil Horizon of Perm Test:	C1
Depth to water level =	35"
Depth to bottom of tube =	46"
Start Soak:	1:32
Start Test:	1:57

	Time Interval (Minutes)	Incremental Volume(L)
Test 1:	10	0.750
Test 2:	10	0.500
Test 3:	10	0.600
Test 4:	10	0.600
Test 5:	10	0.500
Cumulative Time/Volume	**50**	**2.950**

Q=Cumulative Volume cm^3 / Total time in seconds

Q= 0.983 cm^3/sec

Computation of Permeability(k)

k=Q / 5.5 r Hw=

k=coefficient of permeability (cm/sec)
r=inside radius of pipe in centimeters= 7.6 (6" DIA.)
Hw=applied head in centimeters= 28 cm (11 inches)
Q=Computed flow rate in CC/sec= 0.983 cm^3/sec

k=Q / 5.5 r Hw= **0.00084 cm/sec** 1.191 IN/HR

Permeability Test Pit 15-19

Date Performed:	18-Nov-15
Soil Horizon of Perm Test:	C
Depth to water level =	36"
Depth to bottom of tube =	47"
Start Soak:	11:25
Start Test:	11:50

	Time Interval (Minutes)	Incremental Volume(L)
Test 1:	5	1.000
Test 2:	5	1.000
Test 3:	5	1.250
Test 4:	5	1.000
Test 5:	5	1.000
Test 6:	5	1.250
Cumulative Time/Volume	**30**	**6.500**

Q=Cumulative Volume cm^3 / Total time in seconds

Q= 3.611 cm^3/sec

Computation of Permeability(k)

k=Q / 5.5 r Hw=

k=coefficient of permeability (cm/sec)
r=inside radius of pipe in centimeters= 7.6 (6" DIA.)
Hw=applied head in centimeters= 28 cm (11 inches)
Q=Computed flow rate in CC/sec= 3.611 cm^3/sec

k=Q / 5.5 r Hw= **0.00309 cm/sec** 4.373 IN/HR

Permeability Test Pit 15-21

Date Performed:	18-Nov-15
Soil Horizon of Perm Test:	C
Depth to water level =	35"
Depth to bottom of tube =	46"
Start Soak:	9:24
Start Test:	9:38

	Time Interval (Minutes)	Incremental Volume(L)
Test 1:	**Added**	**25 gallons**
Test 2:	**Could**	**Not**
Test 3:	**Maintain**	**Soak**
Cumulative Time/Volume	**0**	**0.000**

Q=Cumulative Volume cm^3 / Total time in seconds

Q= #DIV/0! cm^3/sec

Computation of Permeability(k)

k=Q / 5.5 r Hw=

k=coefficient of permeability (cm/sec)
r=inside radius of pipe in centimeters= 7.6 (6" DIA.)
Hw=applied head in centimeters= 28 cm (11 inches)
Q=Computed flow rate in CC/sec= #DIV/0! cm^3/sec

USE 8.27 in/hr (Rawls Rate)

k=Q / 5.5 r Hw= **#DIV/0! cm/sec** #DIV/0! IN/HR

24800

APPENDIX 2

Long Term Pollution Prevention Plan

Attachment 1

- Designated Snow Stockpiling Plan – SNOW-1
- MassDEP Snow Disposal Guidance

24800

LONG-TERM POLLUTION PREVENTION PLAN

for

Proposed RCS Learning Center

82 Edmands Road
Framingham, Massachusetts

March 21, 2016

Long-Term Pollution Prevention Plan
Proposed RCS School
Framingham, MA

TABLE OF CONTENTS

1.0 INTRODUCTION

This document is a Long-Term Pollution Prevention Plan (LTPPP) prepared by Schofield Brothers LLC for anticipated property management and use relative to the proposed RCS School project in Framingham, Massachusetts. The plan has been prepared for RCS Behavioral & Educational Consulting, LLC to provide the detailed information on practices for pollution prevention and source control to be implemented at the property following construction.

This document has been prepared in accordance with the requirements of the Stormwater Regulations issued by the Massachusetts Department of Environmental Protection (MassDEP), effective January 2, 2008. The document is intended to comply as part of Standard 4 and 9.

The property owner will implement this Long-Term Pollution Prevention Plan and proactively conduct operations at the site in an environmentally responsible manner.

Compliance with this Long-Term Pollution Prevention Plan does not in any way dismiss the owner from compliance with other applicable Federal, State or local laws.

1.1 LONG-TERM POLLUTION PREVENTION PLAN - IMPLEMENTATION

The owner is responsible for the implementation of the Long-Term Pollution Prevention Plan and will reevaluate and amend this Long-Term Pollution Prevention Plan whenever an improvement or modification to operations can be implemented.

1.2 AVAILABILITY OF PLAN DOCUMENTS

The owner shall maintain a copy of the Long-Term Pollution Prevention Plan and related inspection reports, amendments, etc. at their offices. Copies will be made available for review to authorized personnel of the Town of Framingham DPW, and other authorized public officials upon request.

2.0 LONG-TERM POLLUTION PREVENTION PLAN RESPONSIBILITIES

2.1 RESPONSIBLE PARTY AND CONTACT INFORMATION

At the completion of the project, the site will be the responsibility of the owner/applicant. Presently, the responsible party for the implementation of the Long-Term Pollution Prevention Plan is:

RCS Behavioral & Educational Consulting, LLC
6 Strathmore Road
Natick, MA 01760

2.2 RESPONSIBILTIES FOR IMPLEMENTATION

The following responsibilities for the implementation of the Long-Term Pollution Prevention Plan are as follows:

- Oversee property management activities on the site.
- Oversee inspection, monitoring, and reporting compliance.
- Ensure property management contracts include both this Long-Term Pollution Prevention Plan as well as the Stormwater Operations and Maintenance Plan, and any other requirements issued by the Town of Framingham DPW to assure compliance with this Long-Term Pollution Prevent Plan and the Operations and Maintenance Plan.
- Provide training, if necessary, to those responsible for the inspection, monitoring, and maintenance of the site.
- Identify other potential pollutant sources or deficiencies in the BMP's (Best Management Practices) and amend the Long-Term Pollution Prevention Plan as appropriate to address those issues.

3.0 PROJECT DESCRIPTION

3. 1 EXISTING SITE DESCRIPTION

The property at 82 Edmands Road is 6.9+/- acres in area with frontage on Edmands Road. Presently, the site has two (2) residential dwellings with one gravel driveway off Edmands for access.

A major portion of the site is presently wooded and can be described as a pine/oak/maple forest. The site peaks at a large ledge outcropping at the south side of the side. The ledge outcropping travels from east to west. Several other ledge outcroppings can be observed throughout the site.

3. 2 PROPOSED PROJECT

The proposed site work for the project is shown on the site plans and includes the following:

- Construction of school building: 36,215 sf footprint.
- Construction of approximately 1,200 linear feet of driveway. The main entrance will be located on the west side of the property, coinciding with the existing gravel driveway serving the two houses on the property. Proposed access to the two houses will be off the proposed driveway to the school building.

- Construction of parking lot areas providing a total of 162 parking stalls.
- Construction of a gravity sewer to connect to the public sewer in Edmands Road.
- Construction of several stormwater Best Management Practices (BMPs) including a two (2) dry detention basins and six (6) recharge (infiltration) systems. Pretreatment BMPs include deep sump catch basins and a proprietary stormwater treatment system. The BMP treatment trains are designed to provide water quality improvements and to mitigate for groundwater recharge as required.
- Construction of a domestic water service and fire protection service from the water main in Edmands Road.
- Construction associated with grading, landscaping, walkways, utilities, driveways, and site lighting.
- Installation of construction period erosion and sedimentation controls.

The new stormwater management system is designed to assure that the stormwater runoff peak flows after development will be the same or less than the existing conditions at several design points and will meet the recharge and water quality treatment requirements of the MassDEP Stormwater Management Regulations. This is to assure that there will be no impact to the downstream drainage systems. Maintenance requirements for the stormwater management features are included in the Stormwater Operations and Maintenance Plan (Appendix 5).

4.0 PRACTICES FOR SOURCE CONTROL AND POLLUTION PREVENTION

4.1 Good Housekeeping:
Good housekeeping procedures to reduce the possibility of accidental releases and to reduce safety hazards will include but not be limited to the following:

- Proper handling and storage of solid wastes,
- Proper handling, storage and inventory of household chemicals, and
- Prompt cleanup and removal of de minimus releases.
- The owner of the facility will contract for solid waste disposal and recycling.

4.2 Storage and Proper Disposal of Hazardous Chemicals:
The owner/faculty/staff should be aware of not only the potential hazards of various chemicals to the human body but also to the environment. Faculty/staff need to be instructed on the proper disposal of hazardous waste and should use the town programs such as the Hazardous Waste Days for the disposal of various chemicals, including automobile fluids, paints, solvents, cleaners, etc.

4.3 Vehicle Washing:
The washing of personal vehicles on the property is not allowed. The owner should communicate the impacts of outdoor washing of vehicles on the stormwater drainage system. High loads of nutrients, metals, and hydrocarbons can enter the stormwater drainage system and have negative impacts on downstream environments. The use of commercial car wash facilities equipped for the washing of vehicles and equipment should be encouraged. Faculty/staff should assess the integrity of vehicle fluid systems for personal vehicles that could leak significant materials on the property and into the storm drainage system. The owner shall be observant at all times to look for evidence of leaks from vehicles and notify the vehicle owner to repair the leaks.

4.4 Routine Inspections and Maintenance of Stormwater BMP's:
Detailed information regarding stormwater BMPs, including descriptions and maintenance requirements is contained in the Stormwater Operation and Maintenance Plan (Appendix 5).

4.5 Spill Prevention and Response:
The owner will implement release response procedures for releases of significant materials such as fuels, oils, or chemical materials onto the ground or other area that could reasonably be expected to discharge to surface or groundwater.

Reportable quantities will immediately be reported to the applicable Federal, State and local agencies as required by law.

Applicable containment and cleanup procedures will be performed immediately. Impacted material collected during the response must be removed promptly and disposed of in accordance with Federal, State and local requirements. A licensed emergency response contractor may be required to assist in cleanup of releases depending on the size and location of the release, and the ability of the Contractor to perform the required response.

Reportable quantities are established under the following:

1. 40 CFR Part 110 addressing the discharge of oil in such quantities as may be harmful pursuant to Section 311 (b) (4) of the Clean Water Act.
2. 40 CFR Part 117 addresses the determination of such quantities of hazardous substances that may be harmful pursuant to Section 311 (b) (3) of the Clean Water Act.

3. 40 CFR Part 302 addresses the designation, reportable quantities, and notification requirements for the release of substances designated under section 311 (b) (2) (A) of the Clean Water Act.

4.6 Maintenance of Lawns and Landscaped Areas:
The owner should consult with landscape professionals to develop a comprehensive plan for lawn and planting maintenance, which will include timing and application amounts of various turf chemicals, fertilizers, maintenance plantings and lawn repairs, and disposal of leaves and lawn trimmings. The landscape design for most of the turf and planted areas should minimize the need for fertilizers, herbicides and pesticides. However, it will require regular monitoring and maintenance to keep the plantings in healthy condition.

4.7 Storage of Fertilizers, Herbicides, and Pesticides:
These chemicals should be stored inside or under cover with adequate containment.

4.8 Pet Waste Management:
The owner should require and implement "pooper-scooper" requirements for pets on the property to maintain the property free of pet waste.

4.9 Operation and Maintenance of Sewer System
The sewage collection system at the building connects to the public sewer in Edmands Road. The on-site system consists of several sewer manholes and sewer pipes. Many common chemicals can be a threat to the environment if disposed improperly. Hazardous chemicals must NOT be "poured down the drain."

The following are the recommended maintenance and inspection procedures:

a. All components should be regularly inspected by the owner for proper operation. This includes:
   - Sewer Manholes – inspected twice a year. (buildup of sewage in the manholes, blockage of sewer main and general structural integrity.
   - Inflow and Infiltration of Sewer (I&I): Infiltration of groundwater into the sewer lines and structures and leaking building fixtures can be a significant burden on the public sewer system. Leaking fixtures can also be a significant cost and waste of potable water. Sewer systems that infiltrate groundwater in the spring during high groundwater conditions can also exfiltrate sewage into the groundwater which can cause serious pollution problems. Also, surface water runoff can enter the sewer system through manhole covers in depressions, etc. as part of the regular inspection of the sewer system, it is recommended that once per year, the system

should be inspected for I&I. This should be done in the spring during a period when the buildings are not in use and when no flow would be expected. This is to be done by opening manhole covers along the sewer main to check for flow. If flow is detected, the sewer department should be consulted to determine if this is a significant issue that must be addressed.

4.10 Solid Waste Management:
All waste materials are to be stored in securely lidded dumpster(s) or other secure containers as applicable to the material. Said dumpsters and containers will be monitored by the owner and emptied by a licensed waste disposal contractor on a regular basis.

4.11 Snow Disposal and Use of Deicing Chemicals:
Maintenance personnel and any contractors selected for snow plowing and deicing shall be made fully aware of the requirements of this section. During typical snow plowing operations, snow shall be pushed to the shoulders of the roads and parking areas. In circumstances where excess snow is impacting public safety, snow may be stockpiled in the areas designated as snow storage areas shown on the accompanying "Site Plan – Snow Storage" (See Attachment 1). If the snow storage areas are full, the snow shall be removed from the site and properly disposed of in accordance with the MassDEP Snow Disposal Guidance. (See Attachment 1).

Care must be taken to avoid damage of structures and landscaping.

Deicing materials such as sand and salt for roadway deicing are typically not stored at the site. These materials are supplied during snow plowing and deicing operations. Small amounts to handle individual walkways can be stored on site under cover and on an impervious surface or in proper containers within the building.

Alternatives to sodium chloride (commonly used salt) such as sand or calcium chloride, and reduced applications, should be considered and implemented if public safety is not jeopardized.

Before winter begins, the owner and the contractor should review snow plowing, deicing, and stockpiling procedures. Areas designated for stockpiling should be cleaned of any debris. After winter but no later than May 15, the debris must be removed from the stockpiling areas and any damage to the turf, vegetation, fences, etc., should be repaired.

4.12 Street Sweeping
A driveway and parking lot sweeping program should be developed in order to limit the amount of roadway debris and pollutants that could have a

negative effect on the components of the Stormwater Management System. Street and parking lot sweeping a minimum of two (2) times per year is recommended. Frequency should be based on the time of year as well as the weather. The first sweeping should be during the month of March before the spring rains wash off the residual sand from winter applications. This will allow for the highest removal of street dirt and pollutants before they are washed into the other BMP's of the Stormwater Management System. The second sweeping should take place during the month of November to allow for the removal of leaves, twigs, and other debris caused by the late year storms and before the snow arrives. Any other sweeping should be determined by the owner on an as needed basis. If possible, additional sweeping should take place if the roadways and parking lots become cluttered with dirt and debris that may have a negative effect of the other components of the Stormwater Management System.

Once removed from paved surfaces, the sweepings must be handled and disposed of properly. Street sweepings are solid waste subject to the Massachusetts solid waste regulations.

4.13 Stormwater System:
In conjunction with the Long-Term Pollution Prevention Plan, the requirements of the Stormwater Operations and Maintenance Plan (Appendix 5) shall be implemented and the owner will oversee the inspections and preparation of the required inspection reports for compliance with that document.

5.0 INSPECTIONS AND REPORT PREPARATION

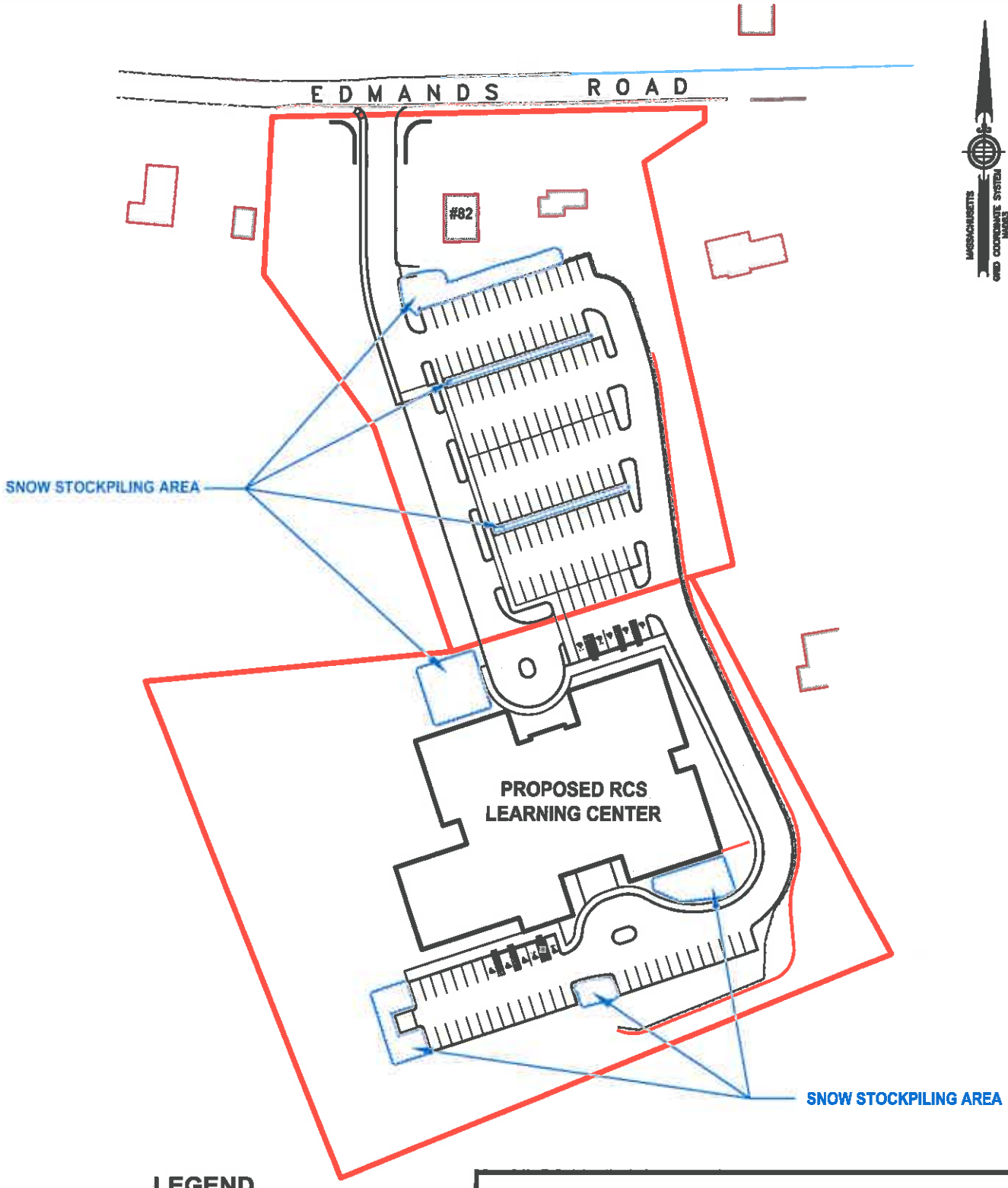
The owner shall maintain inspection and maintenance logs of the maintenance and repair of the site for items as contained in this Long Term Pollution Prevention Plan and Stormwater Operation and Maintenance Plan. Generally, forms need to be completed when inspections, maintenance and repairs are performed and typically on a monthly basis.

6.0 COORDINATION WITH OTHER PERMITS AND REQUIREMENTS

Conditions of approvals from various town offices affecting the long term management of the property shall be considered part of this Long-Term Pollution Prevention Plan. The owner and property manager shall become familiar with those documents and perform their work in compliance thereto.

Attachment 1

- Designated Snow Stockpiling Plan – SNOW-1
- MassDEP Snow Disposal Guidance



MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD83

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LEGEND

SNOW STOCKPILING AREA

DESIGNATED SNOW STOCKPILING PLAN
AT
RCS LEARNING CENTER
IN
FRAMINGHAM, MA 01701

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DATE: **March 21, 2016**

DRAWN BY: **JAL**

SCALE: **1" = 120'**

SNOW-1

24800

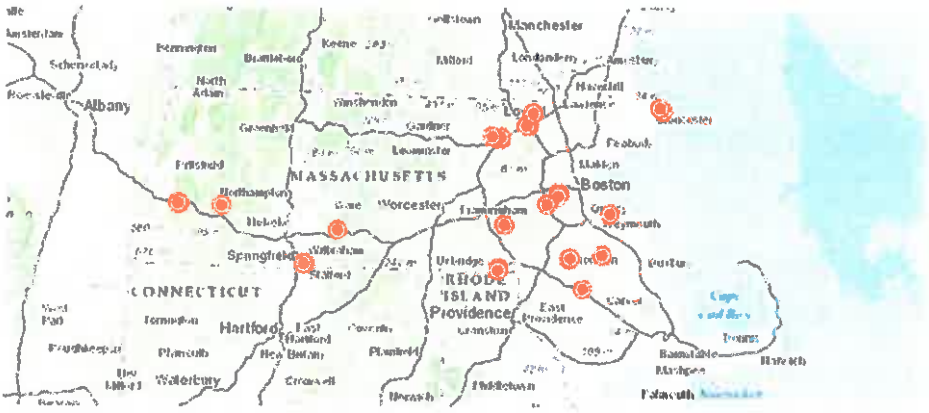
The Official Website of the Executive Office of Energy and Environmental Affairs

Energy and Environmental Affairs

Snow Disposal Guidance

The Massachusetts Department of Environmental Protection's Snow Disposal Guidance below offers information on the proper steps to take when locating sites for the disposal of snow. Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. Public safety is of the utmost importance. However, care must be taken to ensure that collected snow, which may be contaminated with road salt, sand, litter, and automotive pollutants such as oil, is disposed of in a manner that will minimize threats to nearby sensitive resource areas.

In order to avoid potential contamination to wetlands, water supplies, and waterbodies, MassDEP recommends that municipalities and businesses identify and map appropriate upland snow disposal locations. To assist municipalities and businesses in this planning effort, and to avoid use of snow disposal at sites which compromise wetlands resources or public water supplies, MassDEP has developed the following snow disposal mapping tool: https://maps.env.state.ma.us/dep/arcgis/is/templates/PSF/.



Snow Disposal Mapping Tool

More information on this mapping tool can be found in the Snow Disposal Guidance below.

If a community or business demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions are authorized to issue Emergency Certifications under the Massachusetts Wetlands Protection Act for snow disposal in certain wetland resource areas. In such cases, Emergency Certifications can only be issued at the request of a public agency or by order of a public agency for the protection of the health or safety of citizens, and are limited to those activities necessary to abate the emergency.

In the event of a regional or statewide severe weather event, MassDEP may also issue a broader Emergency Declaration under the Wetlands Protect Act which allows greater flexibility in snow disposal practices. Details of this approval process are found below.

Effective Date: December 21, 2015

Snow Disposal Guidance No. BWR G2015-01

Applicability: Applies to all federal, state, regional and local agencies, as well as to private businesses.

Supersedes: BRP Snow Disposal Guideline No. BRPG01-01 issued March 8, 2001, and all previous snow disposal guidance.

Approved by: Douglas Fine, Assistant Commissioner for Water

PURPOSE: To provide guidelines to all government agencies and private businesses regarding snow disposal site selection, site preparation and maintenance, and emergency snow disposal options that are protective of wetlands, drinking water, and water bodies, and are acceptable to the Massachusetts Department of Environmental Protection (MassDEP), Bureau of Water Resources.

A to Z Quick Links

Water Resources Index

APPLICABILITY: These Guidelines are issued by MassDEP's Bureau of Water Resources on behalf of all Bureau Programs (including Drinking Water Supply, Wetlands and Waterways, Wastewater Management, and Watershed Planning and Permitting). They apply to public agencies and private businesses disposing of snow in the Commonwealth of Massachusetts.

INTRODUCTION

Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. While we are all aware of the threats to public safety caused by snow, collected snow that is contaminated with road salt, sand, litter, and automotive pollutants such as oil also threatens public health and the environment.

As snow melts, road salt, sand, litter, and other pollutants are transported into surface water or through the soil where they may eventually reach the groundwater. Road salt and other pollutants can contaminate water supplies and are toxic to aquatic life at certain levels. Sand washed into waterbodies can create sand bars or fill in wetlands and ponds, impacting aquatic life, causing flooding, and affecting our use of these resources.

There are several steps that communities can take to minimize the impacts of snow disposal on public health and the environment. These steps will help communities avoid the costs of a contaminated water supply, degraded waterbodies, and flooding. Everything we do on the land has the potential to impact our water resources. Given the authority of local government over the use of the land, municipal officials and staff have a critically important role to play in protecting our water resources.

The purpose of these guidelines is to help municipalities and businesses select, prepare, and maintain appropriate snow disposal sites before the snow begins to accumulate through the winter. Following these guidelines and obtaining the necessary approvals may also help municipalities in cases when seeking reimbursement for snow disposal costs from the Federal Emergency Management Agency is possible.

RECOMMENDED GUIDELINES

These snow disposal guidelines address: (1) site selection; (2) site preparation and maintenance; and (3) emergency snow disposal.

1. SITE SELECTION

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas or upland locations on impervious surfaces that have functioning and maintained storm water management systems away from water resources and drinking water wells. At these locations, the snow meltwater can filter in to the soil, leaving behind sand and debris which can be removed in the springtime. The following areas should be avoided:

- Avoid importing snow from outside a Zone II or Interim Wellhead Protection Area (IWPA) of a public water supply well or within 75 feet of a private well, where road salt may contaminate water supplies. Only snow from within the Zone II or IWPA should be disposed of within this resource area so as not to increase the potential for pollution of water supplies.
- Avoid dumping of snow into any waterbody, including rivers, the ocean, reservoirs, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid dumping snow on MassDEP-designated high and medium-yield aquifers where it may contaminate groundwater (see below).
- Avoid dumping snow in sanitary landfills and gravel pits. Snow meltwater will create more contaminated leachate in landfills posing a greater risk to groundwater, and in gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water..

Recommended Site Selection Procedures

It is important that the municipal Department of Public Works or Highway Department, Conservation Commission, and Board of Health work together to select appropriate snow disposal sites. The following steps should be taken:

1. Estimate how much snow disposal capacity may be needed for the season so that an adequate number of disposal sites can be selected and prepared.
2. Identify sites that could potentially be used for snow disposal, such as municipal open space (e.g., parking lots or parks).
3 Sites located in upland locations that are not likely to impact sensitive environmental resources should be selected first..
4. If more storage space is still needed, prioritize the sites with the least environmental impact (using the site selection criteria, and local or MassGIS maps as a guide)..

Snow Disposal Mapping Assistance

MassDEP has an online mapping tool to assist municipalities and businesses in identifying possible locations to potentially dispose of snow, should the need arise. The disposal locations depicted on these maps will also aid MassDEP and the Massachusetts Emergency Management Agency assist communities with snow disposal in the event of severe winter storm emergencies. The tool identifies wetland resource areas, public drinking water supplies and other sensitive locations where snow should not be disposed. The tool may be accessed through the Internet at the following web address: https://maps.env.state.ma.us/dep/arcgis/js/templates/PSF/.
By clicking on the link for the OLIVER Online Data Viewer, communities can select your town and overlay different resource areas. The MassGIS site includes MassDEP orthophoto maps depicting local wetland resources, hard copies of which were mailed to each Conservation Commission in the past.

2. SITE PREPARATION AND MAINTENANCE

In addition to carefully selecting disposal sites before the winter begins, it is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the downgradient side of the snow disposal site.
- To filter pollutants out of the meltwater, wherever possible a 50-foot vegetative buffer strip should be maintained during the growth season between the disposal site and adjacent waterbodies.
- Debris should be cleared from the site prior to using the site for snow disposal.
- Debris should be cleared from the site and properly disposed of at the end of the snow season and no later than May 15.

3. SNOW DISPOSAL APPROVALS

Proper snow disposal may be undertaken through one of the following approval procedures:

1. Routine snow disposal – Minimal, if any, administrative review is required in these cases when upland and pervious snow disposal locations or upland locations on impervious surfaces that have functioning and maintained storm water management systems have been identified, mapped, and used for snow disposal following ordinary snowfalls. Use of upland and pervious snow disposal sites avoids wetland resource areas and allows snow meltwater to recharge groundwater and will help filter pollutants, sand, and other debris. This process will address the majority of snow removal efforts until a community exhausts all available upland snow disposal sites. The location and mapping of snow disposal sites will help facilitate each municipality's routine snow management efforts.
2. Emergency Certifications – If a community or business demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions are authorized to issue Emergency Certifications under the Massachusetts Wetlands Protection Act for snow disposal in buffer zones to wetlands, certain open water areas, and certain wetland resource areas, i.e. within flood plains. In such cases, Emergency Certifications can only be issued at the request of a public agency for the protection of the health or safety of citizens or by order of a public agency, and limited to those activities necessary to abate the emergency. Use the following guidelines in these emergency situations:
    a. Dispose of snow in open water with adequate flow and mixing to prevent ice dams from forming.
    b. Do not dispose of snow in salt marshes, vegetated wetlands, certified vernal pools, shellfish beds, mudflats, drinking water reservoirs and their tributaries, Zone IIs or IWPAs of public water supply wells, Outstanding Resource Waters, or Areas of Critical Environmental Concern.
    c. Do not dispose of snow where trucks may cause shoreline damage or erosion.
    d. Consult with the municipal Conservation Commission to ensure that snow disposal in open water complies with local ordinances and bylaws.
3. Emergency Declarations – In the event of a large-scale severe weather event, MassDEP may issue a broader Emergency Declaration under the Wetlands Protection Act which allows municipalities greater flexibility in snow disposal practices. Emergency Declarations typically authorize greater snow disposal options while protecting especially sensitive resources such as public drinking water supplies, vernal pools, land containing shellfish, FEMA designated floodways, coastal dunes, and salt marsh. In the event of severe winter storm emergencies, the snow disposal site maps created by municipalities will assist MassDEP and the Massachusetts Emergency Management Agency in helping communities identify appropriate snow disposal locations.

    If upland disposal sites have been exhausted, the Emergency Declaration issued by MassDEP allows for snow disposal near water bodies. A buffer of at least 50 feet, preferably vegetated, should still be maintained between the site and the waterbody in these situations. Furthermore, it is essential that the other guidelines for preparing and maintaining snow disposal sites be followed to minimize the threat to adjacent waterbodies.

    Under extraordinary conditions, when all land-based snow disposal options are exhausted, the Emergency Declaration issued by MassDEP may allow disposal of snow in certain waterbodies under certain conditions. ***A municipality seeking to dispose of snow in a waterbody should take the following steps:***

    a. Call the emergency contact phone number - 1-888-304-1133 - and notify the MEMA bunker personnel of the municipality's intent.

b. The MEMA bunker personnel will ask for some information about where the requested disposal will take place.

c. The MEMA bunker personnel will confirm that the disposal is consistent with MassDEP's Emergency Declaration and these guidelines and is therefore approved.

During declared statewide snow emergency events, MassDEP's website will also highlight the emergency contact phone number (1-888-304-1133) for authorizations and inquiries. For further non-emergency information about this Guidance you may contact your MassDEP Regional Office Service Center:

Northeast Regional Office, Wilmington, 978-694-3249
Southeast Regional Office, Lakeville, 508-946-2714
Central Regional Office, Worcester, 508-767-2722
Western Regional Office, Springfield, 413-784-1100

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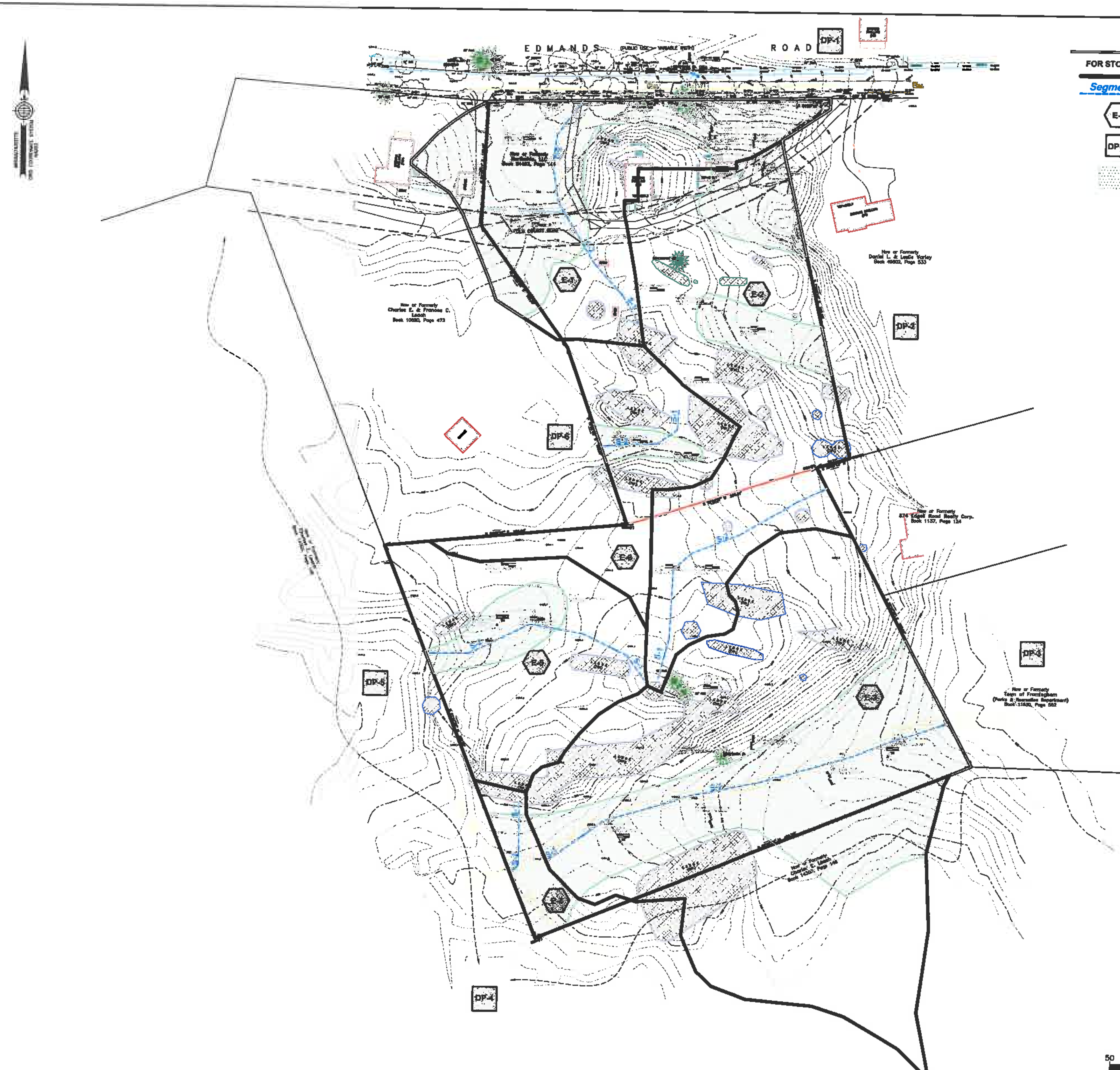
24800

APPENDIX 3

Existing Conditions Watershed Map, WS-EX



LEGEND

FOR STORMWATER MANAGEMENT FEATURES

- WATERSHED BOUNDARY
- *Segment 1* FLOW PATH
- E-1 EXISITING CONDITIONS SUBCATCHMENT DESIGNATION
- DP-1 DESIGN POINT DESIGNATION
- HYDROLOGIC SOIL GROUP (HSG) "A" BOUNDARY

RCS LEARNING CENTER

82 EDMANDS ROAD
874 EDGELL ROAD RR
FRAMINGHAM, MASSACHUSETTS 01701

ASSESSORS: MAP 372, BLOCK, 120 LOT 31
MAP 372, BLOCK, 120 LOT 32

PREPARED FOR:

RCS BEHAVIORAL & EDUCATIONAL CONSULTING, LLC

6 STRATHMORE ROAD
NATICK, MASSACHUSETTS 01760

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DATE: MARCH 1, 2016

SCALE: 1" = 50'

DRAFTED:	CHECKED:	APPROVED:
JAL/KMR	BEC	BEC

EXISTING CONDITIONS WATERSHED MAP

SHEET: 1 OF 2

PROJECT NO.: 24800

WSD-EX

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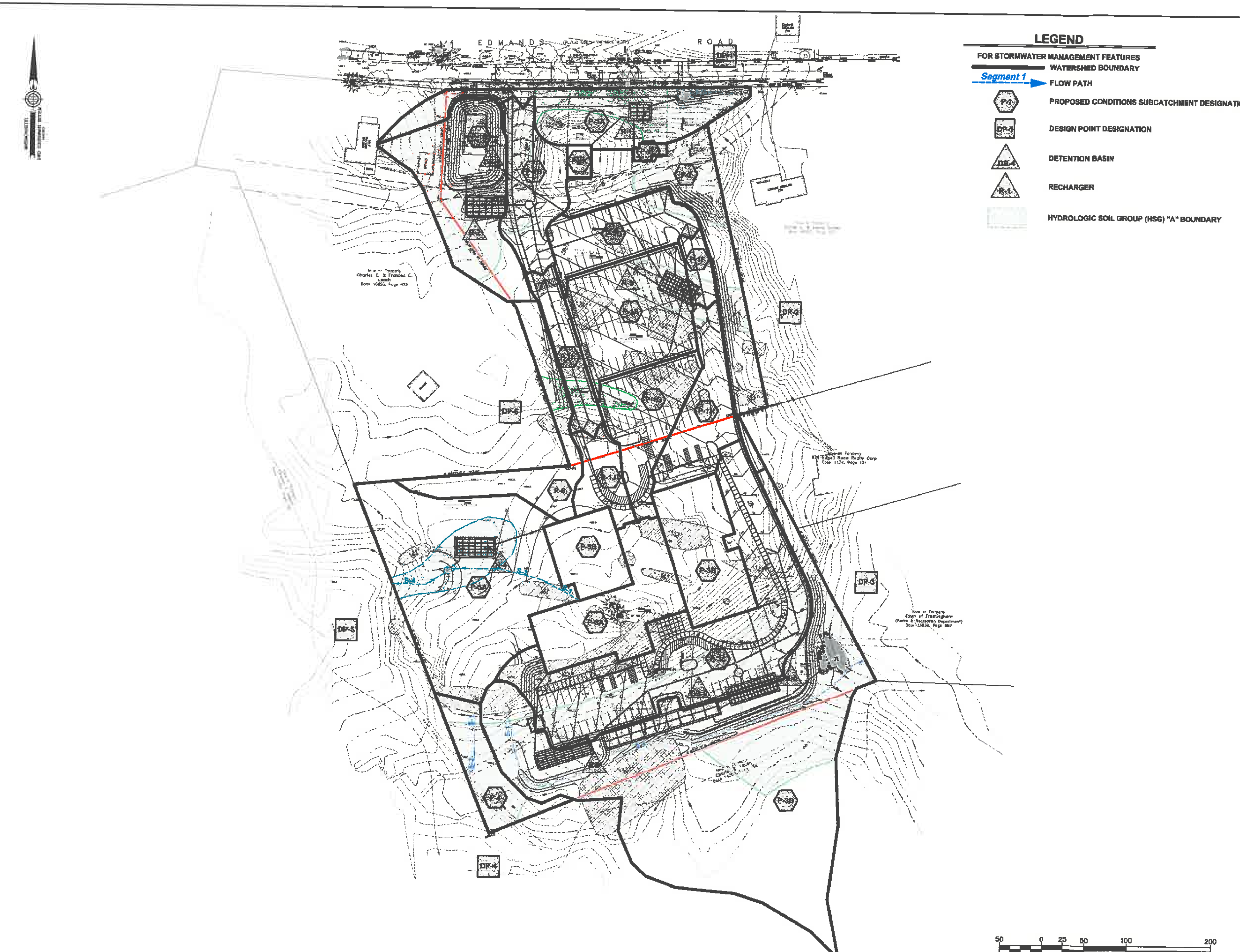
24800

APPENDIX 4

Proposed Conditions Watershed Map, WS-PR



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DATE: MARCH 1, 2016

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PROPOSED CONDITIONS WATERSHED MAP

SHEET: 2 OF 2

PROJECT NO.: 24800

WSD-PR

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24800

APPENDIX 5

Stormwater Operation and Maintenance Plan

24800

STORMWATER OPERATION & MAINTENANCE PLAN

for

Proposed RCS Learning Center

82 Edmands Road
Framingham, Massachusetts

March 21, 2016

STORMWATER
OPERATION AND MAINTENANCE PLAN

RCS LEARNING CENTER
82 EDMANDS ROAD, FRAMINGHAM, MASSACHUSETTS

In order for the stormwater management system to function properly as designed, the system must be inspected on a regular basis and routine maintenance performed. The responsibility for the maintenance and operation of the system will be as follows:

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Natick, MA 01760

Routine inspections and some of the routine maintenance tasks will be performed by the owner's maintenance personnel or hired outside contractors utilized for some items such as the removal of trapped oils and other hydrocarbons from the particle separator treatment units with gas and oil trap outlet, sediment removal from these units, and for some non-routine repairs.

The system contains the following Stormwater Best Management Practices (BMPs):

Deep Sump Catch Basins
Stormwater Treatment Units
Recharge (Infiltration) Systems
Surface Detention Basin
Subsurface Detention Basin

OPERATION AND MAINTENANCE MANUAL AND TRAINING

Upon completion of the construction project, a complete as-built plan of the system components will be prepared and will be a part of this O&M Plan. This O&M Plan includes a description of the purpose and function of each component, inspection and maintenance tasks and schedules, check lists, and report forms. The Plan should be used as the management document for the system. All maintenance personnel shall be trained in the specifics of the entire stormwater management system in order to be able to perform the inspections, documentation and the maintenance required. The design engineer will be available to provide a training session for the supervisors and personnel if necessary.

INSPECTIONS AND MAINTENANCE

The following pages describe the inspection, routine maintenance and non routine maintenance which are required for each BMP. The inspection and maintenance requirements are based on the recommendations from the MassDEP Stormwater Management Standards Handbook, February 2008. Maintenance requirements for the Oil and Sediment Separator - Stormwater Treatment System, will be per the manufacturer's

specifications. We have included the recommended maintenance requirements from the "Stormceptor" design manual. If other systems are selected, maintenance shall be in accordance with the manufacturer's recommendations.

The recommended procedures below should be followed strictly for at least the first two years of the system operation. During that period, the observations and experience gained from the monitoring and maintenance will provide the information necessary so that adjustments can be made for the most efficient operation and maintenance of the system.

NON-STORMWATER DISCHARGES

This is to provide notice to the owner and operator(s) of the subject property and stormwater system that the discharge of any non-stormwater to the subject stormwater management system is prohibited. Also, there shall be no modifications to the stormwater system for the purpose of discharging non-stormwater to the system. Non-stormwater discharges are any liquid or materials that are not the result of natural rainfall runoff or runoff from snow and ice melt. The purpose of this is to protect groundwater and surface water quality as well as to assure compliance with applicable laws.

CONFINED SPACE ENTRY

Note that any inspections or maintenance activity of underground piping, chambers, deep manholes, etc that requires entry into the system must be in accordance with OSHA confined space regulations.

DEEP SUMP CATCH BASINS

DESCRIPTION AND FUNCTION

These structures are modified catch basins that collect stormwater from small drainage areas with added features to enhance the capture of gas, oils, grease, trash, floating debris, and sediment over that of conventional catch basins and stormwater inlets. The inlet of the deep sump catch basin is a cast iron grate over the precast concrete structure. The sump is over-sized to a minimum depth of 4 feet below the elevation of the outlet pipe invert to enhance trapping of sediment. The outlet pipe includes an oil and gas trap hood that keeps floating hydrocarbons and other floating debris in the structure chamber until they settle with the sediment or is removed by a pumper as part of the routine cleaning.

The deep sump catch basins are not efficient enough to provide effective pollutant removal alone, but are an improvement over conventional catch basins and are effective as a pretreatment device for other stormwater BMP's as they are being used in this case.

INSPECTIONS

The deep sump catch basins should be inspected at least four times per year including at the end of the foliage and snow removal seasons. For a full inspection, remove the grate and inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gas, hydrocarbons should

be removed immediately. Measure the amount of sediment that has collected. Pipe outlets should be clear of debris. To be effective, the 4-foot deep sump must be water tight to maintain a permanent pool to the outlet pipe invert. If the water level is below the outlet pipe, closer inspection for possible leaks is warranted. Note that a water level somewhat below the outlet level is normal during extended periods with no precipitation due to evaporation and minor expected seepage.

ROUTINE MAINTENANCE
Initially, the deep sump catch basins should be cleaned a minimum of two times a year and additionally if necessary based on the results of the quarterly inspection. Cleaning consists of the removal of floating hydrocarbons and accumulated sediment, and clearing the inlet grate and outlet tee and pipe. Sediment should be removed from the deep sump catch basin if the measurement of the sediment is over one foot in depth. A hazardous waste disposal contractor must perform the removal of hydrocarbons.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

Repairing the outlet snout and/or pipe
Filling cracks in the concrete
Patching of mortar and brick.
Resetting of inlet grates

MAINTENANCE EQUIPMENT

Hand tools for opening grates
Measuring stick
Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)
Vacuum pumping truck (for sediment removal)

STORMWATER TREATMENT UNITS

INSPECTIONS
The unit should be inspected on a bi-monthly basis and after major storm events for the first year. Remove the cover and inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gasoline, it should be removed immediately. Measure the amount of sediment that has collected using a measuring stick or "Sludge Judge" measuring tube. Pipe inlets and outlets should be clear of debris. After the first year, the number of inspections may be reduced based on the experience during the first year monitoring but not less than 2 times per year. Two of the inspections must include one at the end of the foliage season and one at the end of the snow season.

ROUTINE MAINTENANCE
The units should be cleaned a minimum of two times during the first year or when the sediment level reaches 8 inches in depth per the manufacturer's maintenance specifications. A copy of the "Stormceptor" chart is provided attached to the end of this

section. Cleaning consists of the removal of floating hydrocarbons and accumulated sediment, and clearing the inlet pipes. The removal of hydrocarbons must be performed by a hazardous waste disposal contractor. Removal of the sediment is by a standard vacuum truck.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

Repairing the inlet or outlet pipes.
Filling cracks in the concrete
Resetting of covers.

MAINTENANCE EQUIPMENT

Hand tools for opening covers
Measuring stick or "Sludge Judge".
Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)
Contracted vacuum pumping truck (for sediment removal)

RECHARGE (INFILTRATION) SYSTEMS

DESCRIPTION AND FUNCTION
The subsurface (underground) recharger systems proposed for this project are constructed of precast concrete galleys surrounded by washed stone and filter fabric. The chambers are constructed in a permeable soil suitable for infiltrating. An overflow is provided for the system once the storage volume is exceeded. Manholes/observation ports are brought to finished grade for access.

The purpose of the recharger system is to meet the recharge requirements and to treat runoff from the parking areas per the MassDEP Stormwater Management Standards.

INSPECTIONS
The recharger systems should be inspected after every major storm for the first few months. After this time period it may be inspected once each year and should preferably be done two to three days after a significant storm event. The inspection should examine whether the chamber is draining properly following storms. The underground recharger system should drain within a few hours following the end of a storm up to a maximum of 72 hours. Pipe inlets and outlets should be clear of debris and there should be no significant accumulation of sediment in the chambers. The annual inspection of the infiltration systems should include removal of the key manhole covers/observation ports to view the interior of the chamber. If significant accumulation of sediment occurs, most will be near the inlet pipe(s) to the underground chamber and can be removed by hand or vacuum pumper. A significant accumulation of sediment may indicate a problem with soil migrating into the system from the surrounding soil indicating a failure of the filter fabric protection or a pipe problem in the pipe leading into the system. Also, the outlet control structure for the subsurface recharger system shall be inspected. Refer to the inspection section for the Deep Sump Catch Basin portion of this plan for the proper procedures.

ROUTINE MAINTENANCE
The stormwater system includes significant pretreatment BMPs that protect the recharger system so sediment remove should rarely be required. Routine maintenance generally includes clearing debris from the inlet and outlet pipes if found during an inspection.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Repairing the inlet pipes
- Filling cracks in the concrete
- Resetting of covers
- Removal of significant accumulation of sediment from the chambers that affects the infiltration capacity.

MAINTENANCE EQUIPMENT
Hand tools for opening covers, flash light.
Equipment as may be necessary to comply with OSHA confined space requirements.

STORMWATER DETENTION BASIN

DESCRIPTION AND PURPOSE
The stormwater detention basin is large open, vegetated ponding area that temporarily detains stormwater runoff from the site and regulates the outflow to the downstream drainage system. The outflow is controlled be a concrete outlet control device with properly sized orifices in the front face of the structure and the overflow is provided through a beehive grate located at the top of the structure.

INSPECTIONS
The basin should be inspected semi-annually with additional inspections during the first few months after completion of the re-grading to insure that the vegetation becomes adequately established. The basin should be inspected for slope integrity, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding and sedimentation. Significant ponding should be present for only a few hours following a rain event. The personnel should inspect the outlet structure on a frequent basis (weekly or following rain events) to make sure the outlets are clear.

ROUTINE MAINTENANCE
Repairs and reseeding may be needed during the first few months until the vegetation becomes secure. The basin should be mowed once per year to prevent the establishment of trees and shrubs, except those specifically planted as part of the landscape plan. The mowing must be in the mid-summer when the basin is as dry as possible, and the grass clippings should be removed. The grass should not be cut shorter than four inches. Sediment and debris should be removed at least once a year in late spring. Other tasks include fertilizing of the side slope vegetation, liming, watering, pruning, and weed and pest control.

Debris cannot be allowed to accumulate on the outlet structure. Debris will need to be removed immediately from the outlet structure to keep the outlet orifice and overflow clear and free draining (See INSPECTIONS above).

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

Major repairs of slopes
Repairs to the outlet structure: Repairing the inlet or outlet pipes; filling cracks in the concrete, repairing loose grout; etc.
Removal of accumulated sediment should be performed at least every 10 years or when warranted based on the inspection.

MAINTENANCE EQUIPMENT

Grounds equipment
(mower, rakes, etc.)
Tractor Mower for basin bottom.

SUBSURFACE DETENTION BASIN

DESCRIPTION AND FUNCTION
This subsurface is a 20,000-gallon concrete chamber system located underground near the south property line. Its primary function is to control the peak rate of runoff to ensure that there is no increase in peak flow to abutting property. An outlet control manhole regulates the flow under several design storm events and the chamber system provides the necessary storage volume. Flow from the basin is routed to 30' wide level spreader.

INSPECTIONS
The subsurface detention basin should be routinely inspected on a monthly basis and after rainfall events of over one inch. These "routine inspections" are brief checks primarily to make sure that the outlet structures are clear of debris and to check for erosion or other readily observable structural problems. A thorough inspection should be made at least twice per year conducted during the wet weather to determine if the basin is meeting the targeted detention times (draining properly). For these inspections, inspect the general condition of the basin including the amount of floating debris, sediment, and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons (petroleum products), such as a layer of floating oil or a strong odor of gas, it should be removed immediately and the source of the hydrocarbon investigated for removal from upstream BMP's. Measure the amount of sediment that has collected. The outlet structure and pipes should be clear of debris and inspected for evidence of clogging. Make note of any erosion, tree growth or damage during the inspection.

ROUTINE MAINTENANCE
The detention chambers should be cleaned of sediment as necessary, and at least once every five (5) years. Cleaning consists of the removal trash and floating debris as well as any accumulated sediment. The detention chambers should be cleaned of sediment if the

sediment is over one foot in depth and if there is observable accumulation of sediment (more than a few inches) at the level spreader. A hazardous waste disposal contractor must perform the removal of hydrocarbons if present. The areas over the surface of the detention chambers should remain free of any tree growth. If woody growth is minimal, hand removal using a root wrench or grub hoe is recommended and is generally the most effective.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Repairing any damage to the concrete structures or access manholes.

ROUTINE MAINTENANCE EQUIPMENT

- Power mower (tractor mower) and landscaping equipment (rakes, shovels, wheel barrow).
- Root wrench.
- Measuring stick for sediment depth.
- Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)
- Vacuum pumping truck (for sediment removal)

STORMWATER MANAGEMENT SYSTEM

INSPECTION AND MAINTENANCE FORMS

CONTENTS:

DEEP SUMP CATCH BASINS

Routine Inspection Checklist - Inspected monthly Date _____

	Inlet Grate	Sediment Depth	Hydrocarbons*	Structural Integrity	Pipes Clear	Comments
DSCB #1						
DSCB #2						
DSCB #3						
DSCB #4						
DSCB #5						
DSCB #6						
DSCB #7						
DSCB #8						
DSCB #9						
DSCB #10						
DSCB #11						
DSCB #12						
DSCB #13						
DSCB #14						
DSCB #15						
DSCB #16						
DSCB #17						
DSCB #18						
DSCB #19						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

DEEP SUMP CATCH BASINS

Routine Inspection Checklist - Inspected monthly Date _____

	Inlet Grate	Sediment Depth	Hydrocarbons*	Structural Integrity	Pipes Clear	Comments
DSCB #19						
DSCB #20						
DSCB #21						
DSCB #22						
DSCB #23						
DSCB #24						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

STORMWATER TREATMENT UNITS (STU)

Routine Inspection Checklist - Inspected Semi-Annually Date _____

	Structural Integrity	Sediment Depth	Hydrocarbons*	Inlet/Outlet Pipe	Floating Debris	Comments
STU #1						
STU #2						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

SUBSURFACE INFILTRATION (RECHARGER) SYSTEM

Routine Inspection Checklist - Inspected annually and two to three days after a rainfall. Date _____

	Draining Properly	Sediment	Structural Integrity	Pipe Inlet/Outlet	Debris	Comments
Recharger #1						
Recharger #2						
Recharger #3						
Recharger #4						
Recharger #5						
Recharger #6						

DETENTION BASINS

Routine Inspection Checklist - Inspected Semi-Annually Date _____

	Ponding	Sediment Depth	Outlet Structure	Floating Debris	Comments
Detention Basin #1					

Rip-Rap Outfall	Emergency Spillway	Berm Veg.

	Ponding	Sediment Depth	Outlet Structure	Floating Debris	Comments
Detention Basin #2					
(Subsurface)					

Rip-Rap Outfall	Emergency Spillway	

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

STORMWATER MAINTENANCE / REPAIR RECORD FORM

Date of Maintenance: ________________ Performed By: ________________________

Maintenance / repair tasks were performed on the following on-site BMP structures:

Stormwater Structure Work Performed

Other Comments:

4.0 Stormceptor Maintenance Guidelines

The performance of all storm water quality measures decrease as they fill with sediment. Although the maintenance frequency will be site specific, Rinker Materials generally recommends annual maintenance be performed or when the sediment volume in the unit reaches 15% of the total storage. This recommendation is based on several factors:

- Minimal performance degradation due to sediment build-up.
- Sediment removal is easier when removed on a regular basis (as sediment builds up it compacts and solidifies making maintenance more difficult).
- Development of a routine maintenance interval helps ensure a regular maintenance schedule is followed. Although the frequency of maintenance will depend on site conditions, it is estimated that annual maintenance will be required for most applications; annual maintenance is a routine occurrence which is easy to plan for and remember.

Hydrocarbon Spills

In the event of any hazardous material spill, Rinker Materials recommends maintenance be performed immediately. Maintenance should be performed by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required.

4.1 Recommended Maintenance Procedure

Oil is removed through the 6" inspection / cleanout pipe and sediment is removed through the 24" diameter outlet riser pipe. Alternatively, oil could be removed from the 24" opening if water is removed from the treatment chamber, lowering the oil level below the drop pipes.

The depth of sediment can be measured from the surface of the Stormceptor with a dipstick tube equipped with a ball valve (Sludge Judge ®). Rinker Materials recommends maintenance be performed once the sediment depth exceeds the guideline values provided in Table 8.

Table 8. Sediment Depths Indicating Required Maintenance*

Model	Sediment Depth
450i	8" (200 min)
900	8" (200 mm)
1200	10" (250 mm)
1800	15 " (375 mm)
2400	12" (300 mm)
3600	17" (425 mm)
4800	15 " (375 mm)
6000	18" (450 mm)
7200	15 " (375 min)
11000S	17" (425 mm)**
13000s	20" (500 mm)**
16000s	17" (425 mm)**

**Depths are approximate*

***Depths in each structure*

No entry into the unit is required for routine maintenance of the Inlet Stormceptor or the smaller disc insert models of the In-Line Stormceptor. Entry to the level of the by-pass may be required for servicing the larger in-line models. Any potential obstructions at the inlet can be observed from the surface. The by-pass chamber has been designed as a platform for authorized maintenance personnel, in the event that an obstruction needs to be removed, drain flushing needs to be performed, or camera surveys are required.

Typically, maintenance is performed by the Vacuum Service Industry, a well established sector of the service industry that cleans underground tanks, sewers, and catch-basins. Costs to clean a Stormceptor will vary based on the size of the unit and transportation distances. If you need assistance for cleaning a Stormceptor unit, contact your local Rinker Materials representative, or the Rinker Materials Stormceptor Information Line at (800) 909-7763.

Disposal

The requirements for the disposal of material from a Stormceptor are similar to that of any other Best Management Practices (BMPs). Local guidelines should be consulted prior to disposal of the separator contents.

In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. In some areas, mixing the water with the sediment will create a slurry that can be discharged into a trunk sanitary sewer. In all disposal options, approval from the disposal facility operator/agency is required. Petroleum waste products collected in Stormceptor (oil/chemical/fuel spills) should be removed by a licensed waste management company.

Stormceptor® STC
Inspection and Maintenance Information

Stormceptor® Inspection and Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and are required to insure proper functioning of the Stormceptor System. Both inspection and maintenance of the Stormceptor system is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor System into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Specifically for New Jersey installations, regulations require all BMPs to be inspected a minimum four times per year and after every storm with greater than one inch of rainfall.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after an oil, fuel or other chemical spill.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches 15% of the unit's total storage capacity (see Table 1). Generally, the minimum cleaning frequency is once annually, although the frequency can be based on historical inspection results.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

Table 1

Sediment Maintenance Depth* and Oil Capacity		
STC Model	**Sediment Depth* (inches)**	**Oil Capacity (gallons)**
450i	8	86
900	8	251
1200	10	251
1800	15	251
2400	12	840

3600	17	840
4800	15	909
6000	18	909
7200	15	1059
11000	17	2797
13000	20	2797
16000	17	3055
* based on 15% of the lower chamber volume		

What conditions can compromise the Stormceptor System performance?

- If the system is not maintained regularly and fills with sediment and debris beyond the capacity indicated in Table 1, sediment removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur in the system and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor System is inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. For typical inspection and maintenance activities, no specific supplemental training is required for the Stormceptor System. Information provided in this document or the Stormceptor Operation and Maintenance Manual (provided to the system owner) contains sufficient guidance to maintain the system properly.

In unusual circumstances, such as if a damaged component needs replacement or some other condition requires manned entry into the vessel, confined space entry procedures must be followed. Only professional maintenance service providers trained in these procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

What equipment is typically required for inspection?

- Manhole access cover lifting tool
- Oil dipstick
- Sediment probe
- Flashlight
- Camera
- Data log
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

How is the Stormceptor System inspected?

- The Stormceptor System can be inspected through a standard surface manhole

access cover.

- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick. Oil depth is measured through the oil inspection port. Sediment depth can be measured through the oil inspection port or exit riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick
- Sediment probe
- Flashlight
- Camera
- Data log
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required

How is the Stormceptor System maintained?

- The Stormceptor System can be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
- For 6-ft diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch outlet riser pipe.
- For 4-ft diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch drop tee hole.
- Using the vacuum hose, decant the water from the lower chamber to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
- Remove the sludge from the bottom of the unit using the vacuum hose.
- Re-fill the lower chamber with water where required by the local jurisdiction.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using proper confined space entry procedures.

What is required for proper disposal?

- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.

What about oil spills?

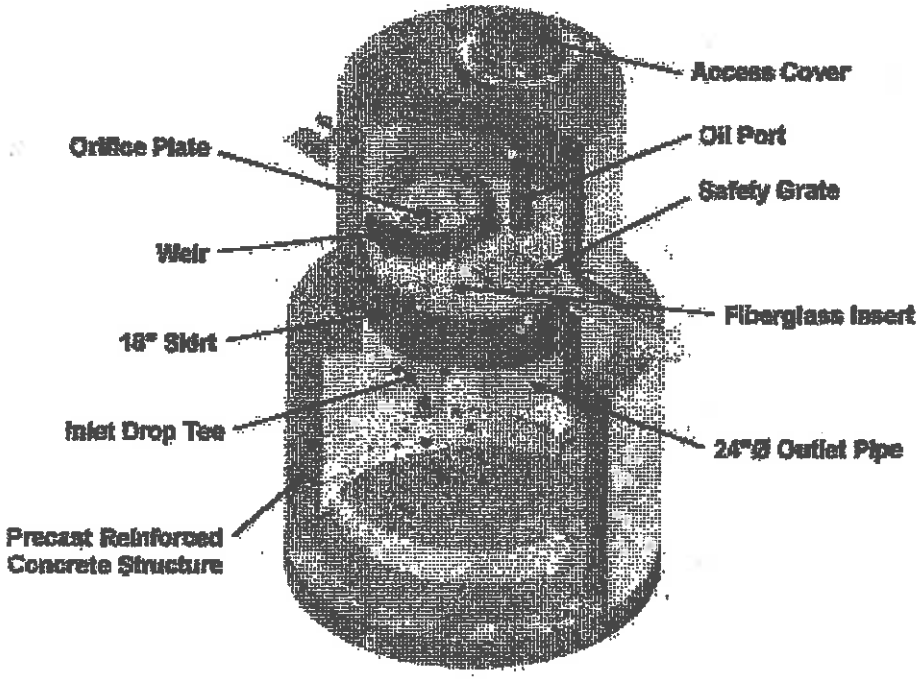
- Petroleum-based pollutants captured by the Stormceptor system (oil/chemical/fuel spills) should be removed and disposed of by a licensed waste management company.
- Although Stormceptor captures virtually all free oil, a sheen at the outlet **does not** mean the unit isn't working. A rainbow or sheen can be visible at oil concentrations of less than 10 mg/L (ppm).

What factors affect the costs involved with inspection/maintenance?

- Inspection and maintenance costs are based on unit size, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

System schematic and component functions

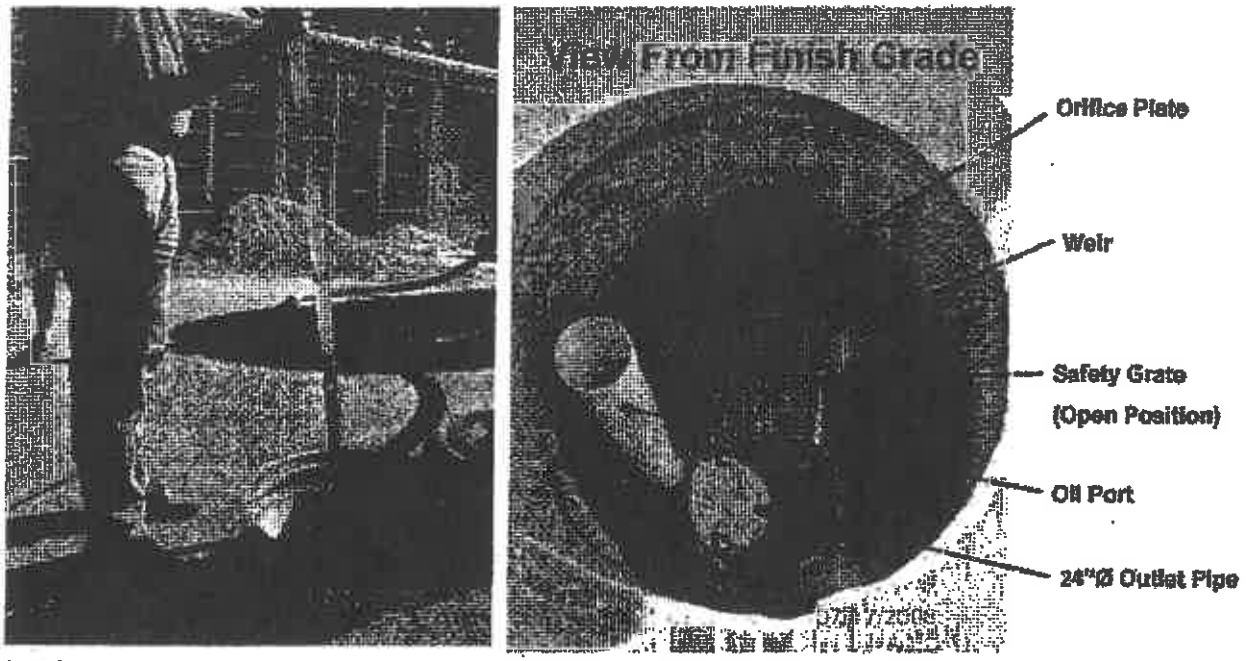
Below is a schematic of the Stormceptor System with key components identified and their functions briefly described.



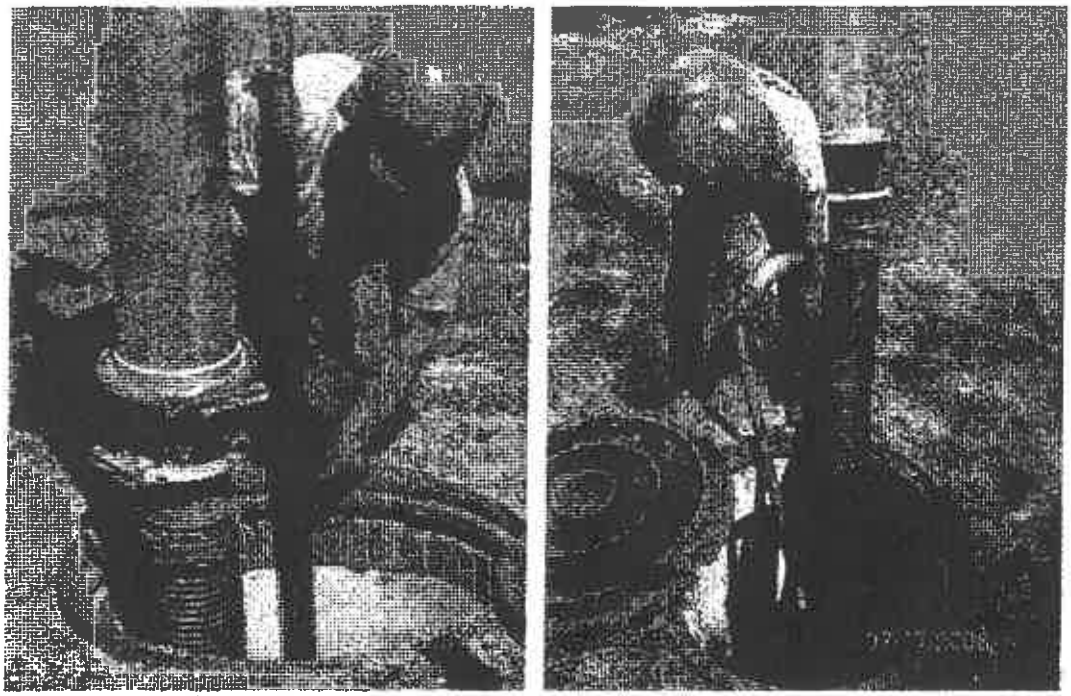
- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower treatment chamber
- **Orifice plate** – controls water flow rate into the lower treatment chamber and prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower treatment chamber and splits flow into two opposite tangential streams
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vactor access port for sediment removal

- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

The Stormceptor System has no moving parts to wear out and therefore maintenance activities are generally focused on pollutant removal.



The depth of sediment can be measured from the surface by using a sediment probe or dipstick tube equipped with a ball check valve and inserted through the 24-inch outlet riser pipe. Oil level can similarly be checked through the oil inspection port.



A maintenance worker stationed on the surface uses a vacuum hose to evacuate water, sediment, and debris from the system.

Purchasing replacement parts

Since there are no moving parts in the Stormceptor System, broken, damaged, or worn parts are not typically encountered. However, if replacements parts are necessary, they may be obtained by contacting the following supplier of authentic Stormceptor components.

In New Jersey, contact:

Camtek Construction Products Corp.
3481 Treeline Drive
Murrysville, PA 15668
Phone: (724) 327-3400

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.